AASHTO INNOVATION INITIATIVE

AASHTO Innovation Initiative

[Proposed] Nomination of Innovation Ready for Implementation

Sponsor

Nominations must be submitted by an AASHTO member DOT willing to help promote the innovation. If selected, the sponsoring DOT will be asked to promote the innovation to other states by participating on a Lead States Team supported by the AASHTO Innovation Initiative.

1. Sponsoring DOT (State): FDOT

2. Name and Title: Hailing Zhang / District Structures Design Engineer

Organization: FDOT

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State: FL

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Innovation Description (10 points)

The term “innovation” may include processes, products, techniques, procedures, and practices.

3. Name of the innovation:

Dual Upright Overhead Sign Structures Design Program

4. Please describe the innovation.

Developed an expedited method to structurally analyze and design Dual-Upright Overhead Sign Structures.

5. What is the existing baseline practice that the innovation intends to replace/improve?

Prior to this team’s innovation, a simplified method was only available to structurally design Single-Upright overhead sign structures. Whenever a Dual-Upright Overhead Sign Structure had to be designed, the engineers had to perform several time-consuming structural calculations independently and create new 3-dimensional computer models from scratch for each specific design.

6. What problems associated with the baseline practice does the innovation propose to solve?

Overhead sign structures support the green and white travel destination sign panels placed above travel lanes on freeways. The structure spans across all the lanes on freeways for one direction and are typically supported on each side of the freeway by two round vertical uprights (1’ to 3’ diameter columns); one placed in the median and the other on the roadside. Within urban areas, where a grassed median is not present, the left upright (aka the median upright) of overhead sign structures is ideally placed on top of a 2-foot-wide median barrier wall. As traffic demand has increased over the years, the width of freeways has increased to accommodate more travel lanes. It is now more common that the required span length of new overhead sign structures has increased to a point where the diameter of the structurally required single upright is larger than the available 2-foot median barrier wall width. The engineering solution is to provide a Dual-Upright on top of the barrier wall that consists of 2 individual uprights (each with widths less than 2 feet) connected to each other via horizontal and diagonal bracing.

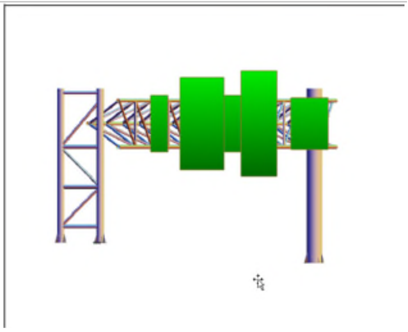
7. Briefly describe the history of its development.

This teams method for designing Dual-Upright Overhead Sign Structures (OHSS) was developed by building-upon and modifying the software program developed by FDOT’s Structures Design Office to design single upright overhead sign structures. The newly developed software application for Dual-Upright OHSS has new coding to address the unique and complicated analysis introduced by having Dual-Uprights. The software also includes and modifies the coding used in the original program for designing Single-Upright OHSS.

8. What resources—such as technical specifications, training materials, and user guides—have you developed to assist with the deployment effort? If appropriate, please attach or provide weblinks to reports, videos, photographs, diagrams, or other images illustrating the appearance or functionality of the innovation (if electronic, please provide a separate file). Please list your attachments or weblinks here.

Preliminary standard design plans were developed. See attached file.

Attach photographs, diagrams, or other images here. If images are of larger resolution size, please provide as separate files.



State of Development (40 points)

Innovations must be successfully deployed in at least one State DOT. The AII selection process will favor innovations that have advanced beyond the research stage, at least to the pilot deployment stage, and preferably into routine use.

9. How ready is this innovation for implementation in an operational environment? Please select from the following options. Please describe.

☒ Prototype is fully functional and yet to be piloted

☐ Prototype has been piloted successfully in an operational environment

☐ Technology has been deployed multiple times in an operational environment

☐ Technology is ready for full-scale implementation

The preliminary design program and standard plans are ready but have not been finalized yet.

10. What additional development is necessary to enable implementation of the innovation for routine use?

FDOT central office needs to finalize the design program and standard plans and release them for use.

11. Are other organizations using, currently developing, or have they shown interest in this innovation or of similar technology?? ☐ Yes ☒ No

If so, please list organization names and contacts. Please identify the source of this information.

Organization	Name	Phone	Email
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.
Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.	Click or tap here to enter text.

Potential Payoff (30 points)

Payoff is defined as the combination of broad applicability and significant benefit or advantage over baseline practice.

12. How does the innovation meet customer or stakeholder needs in your State DOT or other organizations that have used it?

Structural engineers across the state are designing numerous dual upright sign structures.

13. Identify the top three benefit types your DOT has realized from using this innovation. Describe the type and scale of benefits of using this innovation over baseline practice. Provide additional information, if available, using quantitative metrics, to describe the benefits.

Benefit Types	Please describe:
Cost Savings	With a savings of approximately 100 staff hours per design, and based on a total consultant structural engineer rate of $150/hour; the cost savings is estimated at $15,000 per Dual Upright Overhead Sign Structure designed.
Improved Quality	The specifications and plans will be standardized for the entire state for consistency.
Shorter Schedule	The expedited method to structurally analyze and design Dual-Upright Overhead Sign Structures has increased productivity tremendously. Using the new method, a new Dual-Upright OHSS may be structurally analyzed and design in about 3 days (24 staff-hours). Before this new method, each design was typically taking about 3 to 4 weeks (120 – 160 staff hours).

Provide any additional description, if necessary:

Click or tap here to enter text.

14 How broadly might this innovation be deployed for other applications. in the transportation industry (including other disciplines of a DOT, other transportation modes, and private industry)?

This new method to analyze and design Dual-Upright Overhead Sign Structures is openly available for free to everyone and may be used by ALL structural engineers throughout the state of Florida.

Market Readiness (20 points)

The AII selection process will favor innovations that can be adopted with a reasonable amount of effort and cost, commensurate with the payoff potential.

15. What specific actions would another organization need to take along each of the following dimensions to adopt this innovation?

Check boxes that apply	Dimensions	Please describe:
☐	Gaining executive leadership support	Click or tap here to enter text.
☐	Communicating benefits	Click or tap here to enter text.
☐	Overcoming funding constraints	Click or tap here to enter text.
☐	Acquiring in-house capabilities	Click or tap here to enter text.
☐	Addressing legal issues (if applicable) (e.g., liability and intellectual property)	Click or tap here to enter text.
☐	Resolving conflicts with existing national/state regulations and standards	Click or tap here to enter text.
☒	Other challenges	Other state DOTs would need to either adopt FDOT's standards for dual upright sign structures or modify the program to match their states' standards.

16. Please provide details of cost, effort, and length of time expended to deploy the innovation in your organization.

Cost: 1000 staff hours

Level of Effort: moderate

Time: 2 years

17. To what extent might implementation of this innovation require the involvement of third parties, including vendors, contractors, and consultants? If so, please describe. List the type of expertise required for implementation.

None.

Dual Post Upright Span Sign Program LRFD Beta v1.0

FDOT
State Structures Design Office

Read Disclaimer at http://www.dot.state.fl.us/structures

Beta version revised by D6 Structures Office

User Manual

Design Specifications & References:

[LRFD LTS] - AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires & Traffic Signals
[AASHTO] - AASHTO LRFD Bridge Design Specifications.
[SMn] - FDOT Structures Manual. n=1: Structures Design Guidelines; n=3: FDOT Modifications to Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals (LRFDLTS).
[Index] - FDOT Standard Plans.
[AISC] - Steel Construction Manual.

Reference:C:\Users\rd647hz\Desktop\2020-1-28 DualUpright Span Sign Structure LRFDv1.0Beta_V4.0 bolted-dual-upright connection\LRFD

Data Files Folder

Change Folder

C:\Users\rd647hz\Desktop\2020-1-28 DualUpright Span Sign Structure LRFDv1.0Beta_V4.0 bolted-dual-upright connection\Data\

Open Existing Data File (optional)

GGI-5 OHS-1_New Input Matrix.dat

Refresh List

Open File

Project Data

Project Name: SR9A/I-95 N.of Biscayne Canal to SR860/Miami Garden Dr
Project No.: 428358-5-52-01
Designed by: DCC   Date: 3/8/2019
Checked by: Date:

Sign Structure Data

Sign Number: OHS-1
Station: 28+26

Material Properties Data

Upright and Chords : ASTM A500, Web Angles: ASTM A709 Grade 36

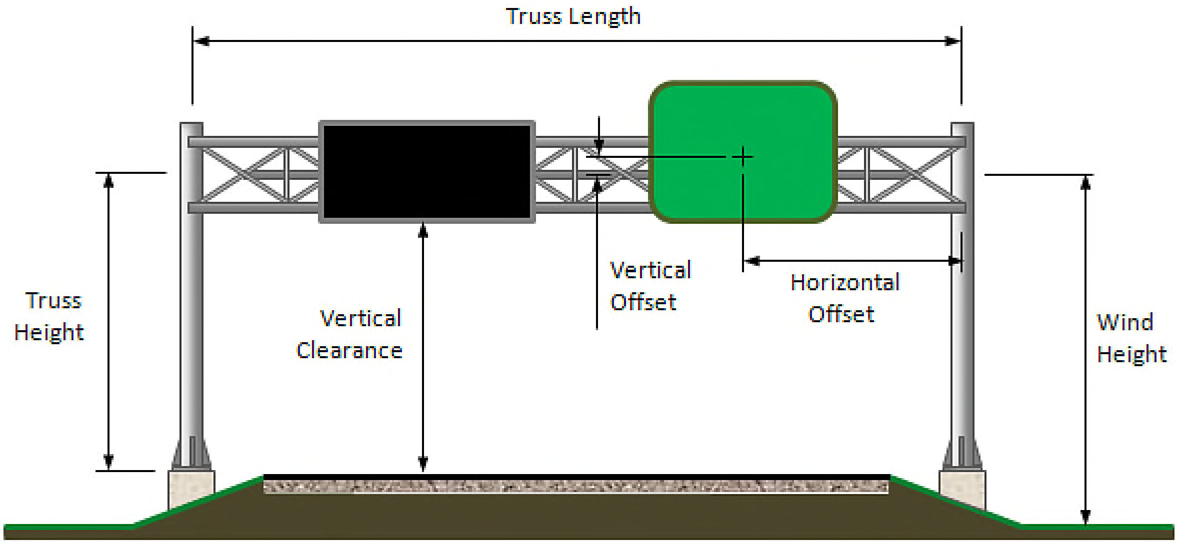
Fy of Left Upright	46	ksi	Fu of Left Upright	58	ksi
Fy of Right Upright	46	ksi	Fu of Right Upright	58	ksi
Fy of Web & Brace	36	ksi	Fu of Web & Brace	58	ksi
Fy of Chord	42	ksi	Fu of Chord	58	ksi

Truss Data

Truss Length (A)	94.26	ft
Left Truss Height (B)	23.79	ft
Right Truss Height (C)	28.15	ft
Vertical Clearance	17.5	ft
No. of Truss Panels (D)	11	
Vert. Truss Depth (E)	7	ft

Wind Load Data

Wind Height	32.11	ft
Design Wind Speed	170	mph



Load Data

Reset Load Data

Sign Panels

Show Panels 11-20

Sign Panel Number	Panel Length (ft)	Panel Height (ft)	Horizontal Offset (ft)	Vertical Offset* (ft)	Back-side Mounted?	Panel Weight (psf)
1	22	10	20.3	0	☐	5
2	18	14.333333	42.3	0	☐	5
3	18	2.5	42.3	8.416667	☐	5
4	6	2.5	48.3	10.916667	☐	5
5	7.5	16	55.1	0	☐	5
6	8	15	80	0	☐	5
7					☐	
8					☐	
9					☐	
10					☐	

DMS Panels

DMS Panel Number	Panel Length (ft)	Panel Height (ft)	Panel Depth (ft)	Horizontal Offset (ft)	Vertical Offset* (ft)	Panel Weight (psf)
1						
2						
3						

Walkways

Walkway Number	Walkway Length (ft)	Walkway Width (ft)	Number of Hangers	Horizontal Offset (ft)	Vertical Offset* (ft)	Walkway Weight (plf)
1						
2						

Attachments

Attachment Number	Projected Area (sq. ft)	Drag Coeff., C_d	Attached to Which Chord Member? (Top / Bottom / Back)	Horizontal Offset (ft)	Attachment Weight (lb)
1					
2					
3					

** Vertical offsets are input as negative values when element centroid is below the truss centerline.*

▶ Member Data

Member Properties

Chord Size (F)

- 3.50 O.D. Pipe, 0.216" Wall"
- 4.00 O.D. Pipe, 0.226" Wall"
- 4.50 O.D. Pipe, 0.237" Wall"
- 4.50 O.D. Pipe, 0.337" Wall"
- 5.563 O.D. Pipe, 0.258" Wall"
- 5.563 O.D. Pipe, 0.375" Wall"
- **6.625 O.D. Pipe, 0.432" Wall"**
- 8.625 O.D. Pipe, 0.500" Wall"
- 8.625 O.D. Pipe, 0.625" Wall"
- CUSTOM

Design Properties

Outside Diameter (D)	6.63	in
Wall Thickness (t)	0.402	in
Area (A)	7.86	in^2
Moment of Inertia (I)	38.2	in^4
Radius of Gyration (r)	2.2	in
Torsional Constant (J)	76.4	in^4
Nominal Weight	28.6	plf

Web Size (G)

- Angle 2-1/2 x 2-1/2 x 1/4
- Angle 3 x 3 x 1/4
- Angle 3 x 3 x 5/16
- Angle 3-1/2 x 3-1/2 x 5/16
- Angle 3-1/2 x 3-1/2 x 3/8
- Angle 4 x 4 x 3/8
- Angle 4 x 4 x 1/2
- **Angle 5 x 5 x 1/2**
- Angle 6 x 6 x 1
- CUSTOM

Design Properties

Leg Length (b)	5	in
Leg Thickness (t)	0.5	in
Area (A)	4.79	in^2
Dist. to Centroid ($\bar{x}$)	1.42	in
X Moment of Inertia (I_x)	11.3	in^4
X Rad. of Gyration (r_x)	1.53	in
Z Rad. of Gyration (r_z)	0.98	in
Nominal Weight	16.2	plf

Left Upright Size (H)

- HSS 18 x 18 x 7/8
- HSS 18 x 18 x 3/4
- HSS 16 x 16 x 7/8
- HSS 16 x 16 x 3/4
- **HSS 16 x 16 x 5/8**
- HSS 16 x 16 x 1/2
- HSS 16 x 16 x 3/8
- HSS 16 x 16 x 5/16
- HSS 14 x 14 x 5/8
- HSS 14 x 14 x 1/2
- HSS 14 x 14 x 3/8

Design Properties

Outside Width (D)	16	in
Wall Thickness (t)	0.625	in
Area (A)	35	in^2
Moment of Inertia (I)	1370	in^4
Radius of Gyration (r)	6.25	in
Torsional Constant (J)	2170	in^4
Nominal Weight	127.37	plf

Left Brace Size (L)

- Angle 2-1/2 x 2-1/2 x 1/4
- Angle 3 x 3 x 1/4
- Angle 3 x 3 x 5/16
- Angle 3-1/2 x 3-1/2 x 5/16
- Angle 3-1/2 x 3-1/2 x 3/8
- Angle 4 x 4 x 3/8
- Angle 4 x 4 x 1/2
- Angle 5 x 5 x 1/2
- **Angle 6 x 6 x 1**
- CUSTOM

Design Properties

Leg Length (b)	6	in
Leg Thickness (t)	1	in
Area (A)	11	in^2
Dist. to Centroid ($\bar{x}$)	1.86	in
X Moment of Inertia (I_x)	35.4	in^4
X Rad. of Gyration (r_x)	1.79	in
Z Rad. of Gyration (r_z)	1.17	in
Nominal Weight	37.4	plf

Right Upright Size (J)

Design Properties

Outside Diameter (D)	24	in
Wall Thickness (t)	0.75	in
Area (A)	54.8	in^2
Moment of Inertia (I)	3705	in^4
Radius of Gyration (r)	8.22	in
Torsional Constant (J)	7411	in^4
Nominal Weight	186.4	plf

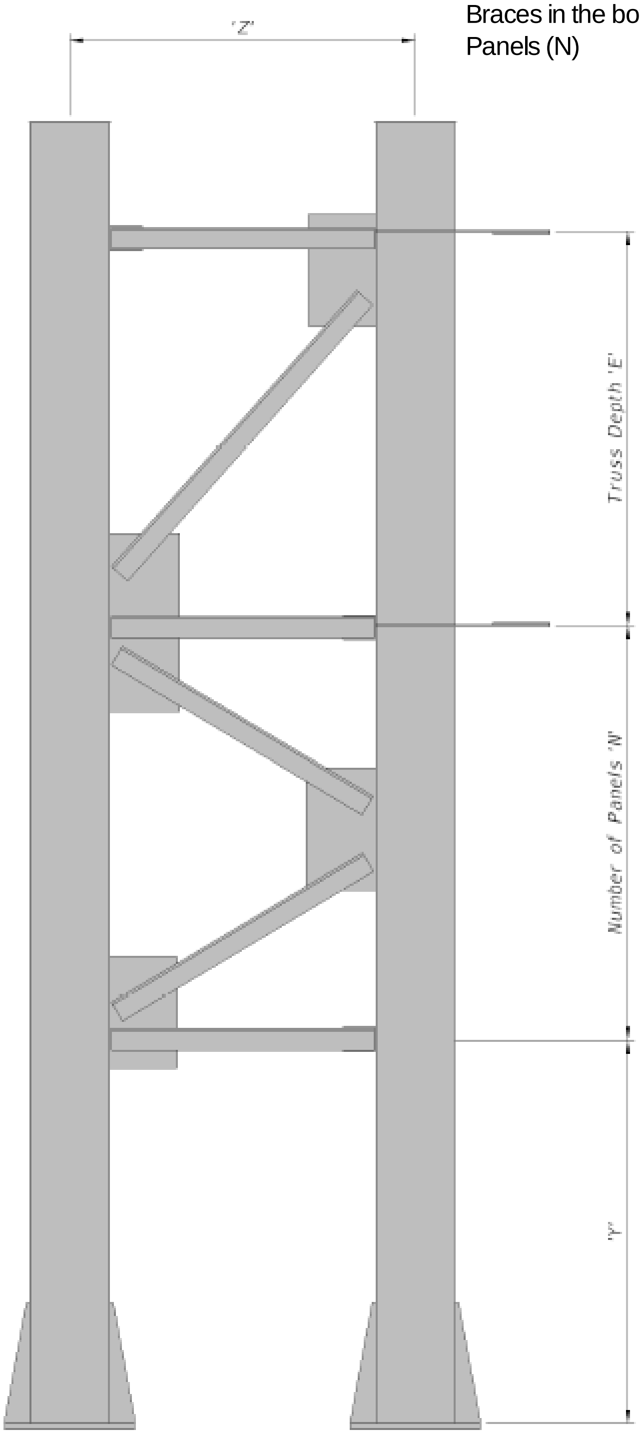
Dual Upright Data

Dual Upright Geometry

Uprights Span (Z) 96 in

Distance from base to first horizontal brace (Y) 108 in

Number of Diagonal Braces in the bottom Panels (N) 2 [✓ 3]



Connection Data

Splice

Min.Splice Bolt Diameter (SC) by user:

Number of Splice Bolts (SB)

Note: The program will automaticalaly design the bolt size. If the designed bolt's size is bigger than the user input size, the designed bolt diameter will be used in the output. Otherwise, the user input value will be used in the output.

Gusset Plates (GB and GN)

Min. Gusset Bolt Diameter

Min. Gusset Plate Thickness (GA and GM)

Truss Connections

Left Truss Bolt Diameter (LA)

Right Truss Bolt Diameter (RA)

Number of Left Truss Bolts (LB)

Number of Right Truss Bolts (RB)

Min. Horizontal Plate Thickness (LC, RC)

Min. Vertical Plate Thickness (LD,RD)

Base Connection

Left Anchor Bolt Diameter (BA)

Left Number of Anchor Bolts (BB)

Min. Base Plate Thickness (BC,CC)

Right Anchor Bolts Diameter (CA)

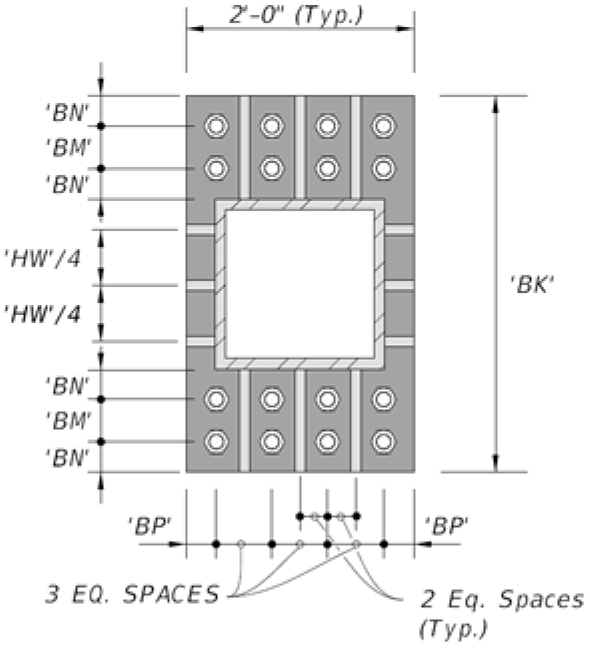
Right Number of Anchor Bolts (CB)

Min. Stiffener Plate Thickness (BD,CD)

Base Connection (Cont.)

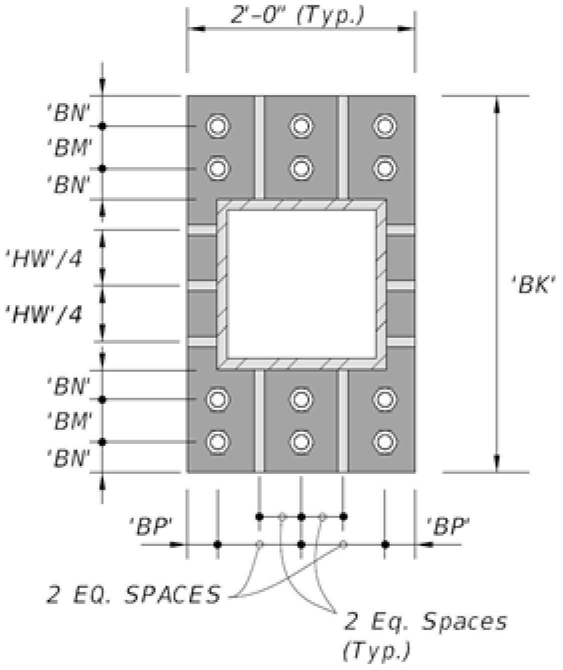
Base Plate Length (BK) 4 ft

Anchor Bolt Spacing in Longitudinal Direction (BM) 6.125 in



Option 1

For Number Anchor 8, 16



Option 2

For Number Anchor 12

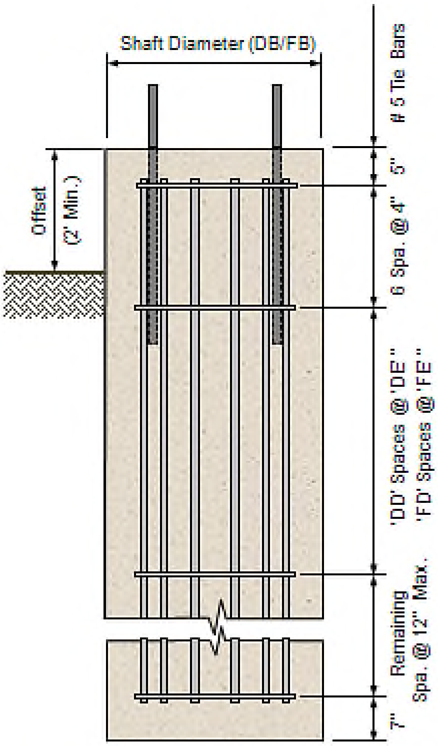
Foundation Data

Foundation Type	Drilled Shafts None

Left Drilled Shaft Data

Soil Type	Sand Clay

Soil Density, γ_{soil}	52	pcf
Friction Angle, ϕ	33	deg
SPT Number (N_{blows})	16	
Shear Strength, *c*		ksf
Shaft Diameter (DB)	4.5	ft
Ground to Top of Shaft Offset	4	ft
Number of Stirrup Spaces (DD)	30	
Stirrup Spacing (DE)	6	in



Right Drilled Shaft Data

Soil Type	Sand Clay

Size of Longitudinal Bars (DC)	11 14

Soil Density, γ_{soil}	51	pcf
Friction Angle, ϕ	32	deg
SPT Number (N_{blows})	12	
Shear Strength, *c*		ksf
Shaft Diameter (FB)	4.5	ft
Ground to Top of Shaft Offset	4	ft
Number of Stirrup Spaces (FD)	30	
Stirrup Spacing (FE)	6	in

▶ Save Data

Save Data File (optional)

☑ Use current input file

File Name GGI-5 OHS-1_New Input Matrix.dat Save Data

Note: Select an output folder by using the "Change Folder" option above.

▶ Data Initialization

▶ Geometry Check Calculations

Preliminary Geometry Checks

$CheckLengt_{TrussPanel} = \text{"OK"}$

$CheckClearance_{Wed} = \text{"OK"}$

$CheckLayout_{SignPanel\_} = \text{"OK"}$

$CheckOverlap_{Panel} = \text{"OK"}$

$Check_{DMS} = \text{"n/a"}$

$Check_{BarrierLength} = \text{"OK"}$

▶ 3D Model Data

▶ Wireframe Diagram

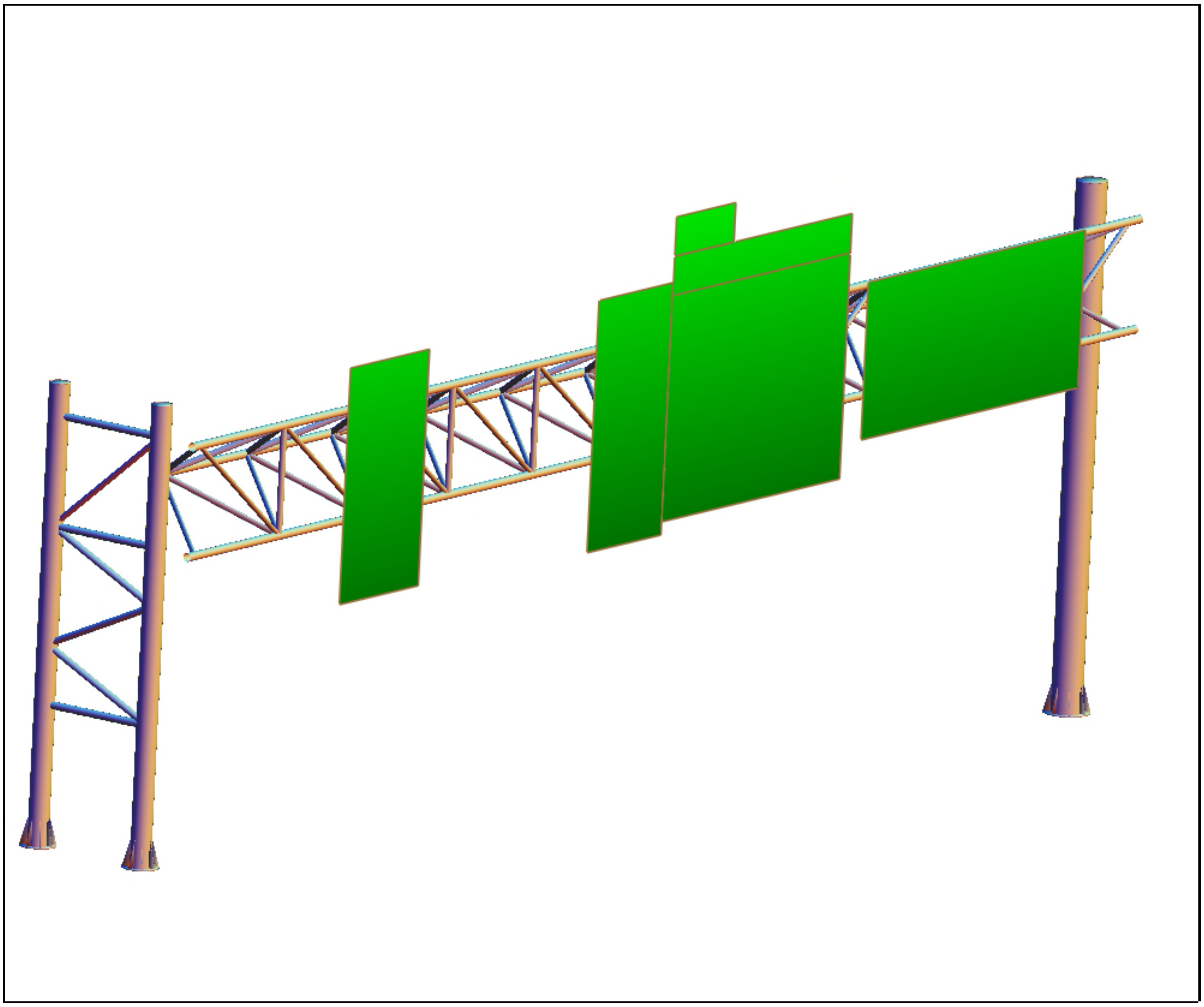
▶ Design Forces

▶ Fatigue Forces

▶ Total Forces

▶ Truss Diagram Data

Truss Diagram



Note: Use your mouse and keyboard to zoom in, zoom out or rotate the 3D plot above.
(See "Rotating, Spinning, or Zooming a 3D Plot" in Mathcad Help for instructions.)

3D Structural Analysis

Run Analysis

Note: A new analysis MUST be run after any change in program input.

▶ PC-SAP Output Data

▶ Design Check Calculations

▶ Maximum Reactions

▶ Results Output

▶ Dual Upright Design

Results $v_{wind} = 170 \cdot mph$

Sign Structure Geometry

(A) $L_{Truss} = 94.26\,ft$

(B) $H_{Left.Truss} = 23.79\,ft$

(C) $H_{Right.Truss} = 28.15\,ft$

(D) $\#TrussPanels$ = "11 @ 8' 6-3/4" (Total_Length = 94.26 ft.)"

(E) $D_{VerticalTruss} = 84 \cdot in$

$D_{HorzTruss} = 72.7461 \cdot in$

Sign Structure Members

(F) $ChordMember$ = "6.625 O.D. Pipe, 0.432" Wall"" CFI_{Chord} = "0.716 OK"

(G) $WebMember$ = "Angle 5 x 5 x 1/2" CFI_{Web} = "0.624 OK"

(J) $UprightMember_{Right}$ = "24" O.D. Pipe, 0.750" Wall" $CFI_{RtUpright}$ = "0.788 OK"

(K) $Camber$ = "1-1/4""

Left Upright Members

(L) $BraceMember$ = "Angle 6 x 6 x 1" $CFI_{LtBrace}$ = "0.39 OK"

(H) $UprightMember_{Left}$ = "HSS 16 x 16 x 5/8" $CFI_{LtUpright}$ = "0.426 OK"

Left Upright Geometry

(Y) $Y_{Left.Dual.Upright} = 108 \cdot in$

(N) $Panel_{Left.Dual.Upright} = 3$

(X) $X_{Left.Dual.Upright} = 3.763 \cdot ft$

(Z) $Z_{Left.Dual.Upright} = 96 \cdot in$

Additional Design Checks

$CheckSlenderness_{Web}$ = "OK" $\lambda_{web} = 10$ $\lambda_{web.local.compact} = 10.785$

$CheckSlenderness_{Chord}$ = "OK" $\lambda_{chord} = 16.493$ $\lambda_{chord.local.compact} = 48.333$

$CheckSlenderness_{Brace}$ = "OK" $\lambda_{brace} = 6$ $\lambda_{brace.local.compact} = 10.785$

$Check_{Classification.chord}$ = "OK" $SectionClassification_{.local.buckling.chord}$ = "Compact"

$Check_{Classification.web}$ = "OK" $SectionClassification_{.local.buckling.web}$ = "Compact"

$Check_{Classification.brace}$ = "OK" $SectionClassification_{.local.buckling.brace}$ = "Compact"

$Check_{UprightSlenderness}$ = "OK"

$Check_{Uprights}$ = "OK"

$CheckDeflection_{Upright}$ = "OK" $MaxDeflection = 0.146 \cdot in$ $\Delta Limit := 2.5\% \cdot H_{Truss} = 0.178 \cdot in$

$CheckRotation_{Upright}$ = "OK" $MaxRotation = 0.063 \cdot deg$ $RotLimit := 1.67 \cdot deg$

$Check_{TrussDeflection}$ = "OK"

$Check_{SignHangers}$ = "Warning: Sign panel(s) may require additional vertical hangers."

Max. Reactions at Base of Left Upright

Front Upright

$LongMomF_{Lt} = 141.833 \cdot kip \cdot ft$

$LongShearF_{Lt} = 22.430 \cdot kip$

$TransMomF_{Lt} = 83.500 \cdot kip \cdot ft$

$TransShearF_{Lt} = 8.265 \cdot kip$

$AxialF_{Lt} = 117.300 \cdot kip$

$TorqueF_{Lt} = 13.708 \cdot kip \cdot ft$

Max. Reactions at Base of Right Upright

$LongMom_{Rt} = 1022.500 \cdot kip \cdot ft$

$LongShear_{Rt} = 39.050 \cdot kip$

$TransMom_{Rt} = 91.083 \cdot kip \cdot ft$

$TransShear_{Rt} = 8.272 \cdot kip$

$Axial_{Rt} = 20.350 \cdot kip$

$Torque_{Rt} = 15.875 \cdot kip \cdot ft$

▶ Splice Calculations

▶ Gusset Plate Calculations

▶ Truss Connection Calculations

▶ Base Plate Calculations

▶ Anchor Bolts and Upright to Base Plate Connection Output Preparation

Anchor Bolts and Upright to Base Plate Connection Values

Note: Anchor bolts are ASTM F1554. All welds are sized assuming E70xx electrodes.

Left Base Connection

(BA) $d_{LtAnchor}$ = "1-1/2" Dia."

(BB) $\#AnchorLt$ = 16

(BC) t_{LtBase} = "1-3/4""

(BD) $t_{LtStiff}$ = "1/2""

(BE) $H_{LtStiff}$ = "1' 6-3/4""

(BF) $Weld_{LtBaseInside}$ = "5/16""

(BG) $Weld_{LtBaseOutside}$ = "5/16""

(BH) $Weld_{LtStifftoBase}$ = "5/16""

(BJ) $Weld_{LtStifftoUpright}$ = "5/16""

(BK) BKa = "4' 0""

(BM) BMa = "6-1/8"" $\cdot in$

(BN) $EdgeLa$ = "4-15/16"" $\cdot in$

(BP) $EdgeXa$ = "3-1/2"" $\cdot in$

Additional Base Connection Checks

$CheckThicknessRatio_{LtStiff.to.Upright}$ = "OK"

$CheckWeldSizeLimit_{LtBaseUpright.in}$ = "OK"

$CheckWeldSizeLimit_{LtBaseUpright.out}$ = "OK"

$CheckWeldSizeLimit_{LtStiffBase}$ = "OK"

$CheckWeldSizeLimit_{LtStiffUpright}$ = "OK"

$CheckSpacing_{LtHStiffBrace}$ = "OK"

$CheckSpacing_{LtStiff}$ = "OK"

▶ Connection Output

Connection Values

Note: All truss bolted connections use A325 bolts, and upright anchor bolts are ASTM F1554.
All welds are sized assuming E70xx electrodes.

Splice Connection

(SA) $Size_{Angle}$ = "Angle 6" x 6" x 1/2""

(SB) $\#Bolts_{Reqd.in.Splice}$ = "6"

(SC) $d_{BoltReqd.for.Splice}$ = "1-1/4" Dia."

$CheckSpacing = \text{"OK"}$

$CheckBolt_{Splice} = \text{"OK"}$

Alternate Flange Splice Connection

(PA) $t_{Flange} = \text{"1-1/2""}$

(PB) $Offset_{Bolt} = \text{"2""}$

(PC) $Weld_{Inside} = \text{"3/8""}$

(PD) $Weld_{Outside} = \text{"7/16""}$

(PE) $d_{Bolt} = \text{"1""}$

(PF) $\#Bolts = \text{"12"}$

Gusset Plates

(GA) $t_{Gus} = \text{"3/4""}$

(GB) $d_{GusBolt} = \text{"1" Dia."}$

(GC) $L_{BackChordGus} = \text{"1' 6-1/2""}$

(GD) $H_{BackChordGus} = \text{"9-1/4""}$

(GE) $L_{FrontChordGus} = \text{"1' 6-1/4""}$

(GF) $H_{FrontChordGus} = \text{"8""}$

(GG) $L_{CenterFrontGus} = \text{"2' 5-3/4""}$

(GH) $L_{BackTrussEnd} = \text{"2' 0""}$

(GJ) $H_{BackTrussEnd} = \text{"11-3/4""}$

(GK) $L_{FrontTrussEnd} = \text{"1' 4-1/4""}$

(GL) $Weld_{Gusset.To.Chord} = \text{"3/16""}$

$CheckThickness_{Gusset} = \text{"OK"}$

Brace Gusset Plates

(GM) $t_{GusBr} = \text{"3/4""}$

(GN) $d_{GusBrBolt} = \text{"7/8""}$

(GO) $H_{Brace2} = \text{"11-1/2""}$

(GP) $L_{Brace2} = \text{"1' 8-3/4""}$

(GQ) $H_{Brace2Slant} = \text{"11-1/2""}$

(GR) $L_{Brace2Slant} = \text{"1' 9-3/4""}$

(GS) $H_{Brace3} = \text{"1' 0""}$

(GT) $L_{Brace3} = \text{"2' 6-3/4""}$

(GU) $H_{Brace1} = \text{"6-1/4""}$

(GV) $Weld_{Gusset.To.Brace} = \text{"1/2""}$

$CheckThickness_{BrGusset} = \text{"OK"}$

$CheckLength_{Brace1} = \text{"OK"}$

Left Truss Connection

(LA) d_{LtBolt} = "7/8" Dia."

(LB) $\#Bolts_{Lt}$ = "6"

(LC) $t_{LtHorzConnPL}$ = "1/2""

(LD) $t_{LtVertConnPL}$ = "5/8""

(LE) $Weld_{LtHorzPLtoUpright}$ = "3/16""

(LF) $Weld_{LtVertPLtoUpright}$ = "1/4""

(LG) $Weld_{LtConnPLtoChord}$ = "3/16""

(LH) $Weld_{LtVertPLtoHorzPL}$ = "3/16""

Additional Left Truss Connection Checks

$CheckBolt_{LtTruss.Alter}$ = "OK"

$CheckBolt_{LtTruss}$ = "OK"

$CheckThickness_{LtHorz.Plate}$ = "OK"

$CheckThickness_{LtVert.Plate}$ = "OK"

$CheckThickness_{LtConn.Plate}$ = "OK"

$CheckThickness_{LtHorz.Vert}$ = "OK"

$Check_{LtHorzPL}$ = "OK"

$Check_{LtVertPL}$ = "OK"

$Check_{LtUpright}$ = "OK"

Right Truss Connection

(RA) d_{RtBolt} = "7/8" Dia."

(RB) $\#Bolts_{Rt}$ = "6"

(RC) $t_{RtHorzConnPL}$ = "1/2""

(RD) $t_{RtVertConnPL}$ = "1/2""

(RE) $Weld_{RtHorzPLtoUpright}$ = "3/16""

(RF) $Weld_{RtVertPLtoUpright}$ = "3/16""

(RG) $Weld_{RtConnPLtoChord}$ = "3/16""

(RH) $Weld_{RtVertPLtoHorzPL}$ = "3/16""

Additional Right Truss Connection Checks

$CheckBolt_{RtTruss.Alter}$ = "OK"

$CheckBolt_{RtTruss}$ = "OK"

$CheckThickness_{RtHorz.Plate}$ = "OK"

$CheckThickness_{RtVert.Plate}$ = "OK"

$CheckThickness_{RtConn.Plate}$ = "OK"

$CheckThickness_{RtHorz.Vert}$ = "OK"

$Check_{RtHorzPL}$ = "OK"

$Check_{RtVertPL}$ = "OK"

$Check_{RtUpright}$ = "OK"

Left Base Connection

(BA) $d_{LtAnchor}$ = "1-1/2" Dia."

(BB) $\#AnchorLt$ = 16

(BC) t_{LtBase} = "1-3/4""

(BD) $t_{LtStiff}$ = "1/2""

(BE) $H_{LtStiff}$ = "1' 6-3/4""

(BF) $Weld_{LtBaseInside}$ = "5/16""

(BG) $Weld_{LtBaseOutside}$ = "5/16""

(BH) $Weld_{LtStifftoBase}$ = "5/16""

(BJ) $Weld_{LtStifftoUpright}$ = "5/16""

Right Base Connection

(CA) $d_{RtAnchor}$ = "2" Dia."

(CB) $\#AnchorRt$ = 16

(CC) t_{RtBase} = "1-3/4""

(CD) $t_{RtStiff}$ = "1/2""

(CE) $H_{RtStiff}$ = "2' 2-1/4""

(CF) $Weld_{RtBaseInside}$ = "5/16""

(CG) $Weld_{RtBaseOutside}$ = "5/16""

(CH) $Weld_{RtStifftoBase}$ = "5/16""

(CJ) $Weld_{RtStifftoUpright}$ = "3/16""

Additional Base Connection Checks

$CheckEdgeL_{LtAnchor}$ = "OK"

$CheckSpaceL_{LtAnchor}$ = "OK"

$CheckThicknessRatio_{LtStiff.to.Upright}$ = "OK"

$CheckThicknessRatio_{RtStiff.to.Upright}$ = "OK"

$CheckWeldSizeLimit_{LtBaseUpright.in}$ = "OK"

$CheckWeldSizeLimit_{LtBaseUpright.out}$ = "OK"

$CheckWeldSizeLimit_{RtBaseUpright.in}$ = "OK"

$CheckWeldSizeLimit_{RtBaseUpright.out}$ = "OK"

$CheckWeldSizeLimit_{LtStiffBase}$ = "OK"

$CheckWeldSizeLimit_{RtStiffBase}$ = "OK"

$CheckWeldSizeLimit_{LtStiffUpright}$ = "OK"

$CheckWeldSizeLimit_{RtStiffUpright}$ = "OK"

$CheckSpacing_{LtStiff}$ = "OK"

$CheckSpacing_{RtStiff}$ = "OK"

Fatigue Calculations

Fatigue Design Checks

Left Base Connection

$CheckFatigue_{LtUpright}$ = "OK (0.94 ksi < 7 ksi)"

$CheckFatigue_{LtBase}$ = "OK (0.34 ksi < 10 ksi)"

$CheckFatigue_{LtAnchor}$ = "OK (0.34 ksi < 7 ksi)"

Right Base Connection

$CheckFatigue_{RtUpright}$ = "OK (3.09 ksi < 7 ksi)"

$CheckFatigue_{RtBase}$ = "OK (1.55 ksi < 10 ksi)"

$CheckFatigue_{RtAnchor}$ = "OK (0.17 ksi < 7 ksi)"

Chord Member Connections

$CheckFatigue_{ChordSplice}$ = "OK (2.13 ksi < 7 ksi)"

$CheckFatigue_{ChordSlot}$ = "OK (0.27 ksi < 2.6 ksi)"

$CheckFatigue_{HalfChord}$ = "OK (0.2 ksi < 2.6 ksi)"

$CheckFatigue_{LtTrussBolt}$ = "OK (0.16 ksi < 7 ksi)"

$CheckFatigue_{RtTrussBolt}$ = "OK (0.16 ksi < 7 ksi)"

Web Gusset Plates

$CheckFatigue_{BackPlate}$ = "OK (0.06 ksi < 1.2 ksi)"

$CheckFatigue_{BackEndPlate}$ = "OK (0.16 ksi < 1.2 ksi)"

$CheckFatigue_{FrontPlate}$ = "OK (0.12 ksi < 1.2 ksi)"

$CheckFatigue_{FrontEndPlate}$ = "OK (0.12 ksi < 1.2 ksi)"

$CheckFatigue_{TopCenterPlate}$ = "OK (0.1 ksi < 1.2 ksi)"

$CheckFatigue_{BotCenterPlate}$ = "OK (0.11 ksi < 1.2 ksi)"

Web Members

$CheckFatigue_{Web}$ = "OK (0.8 ksi < 7 ksi)"

Brace Gusset Plates

$CheckFatigue_{BraceOne}$ = "OK (0.44 ksi < 1.2 ksi)"   *for Detail BA*

$CheckFatigue_{BraceTwo}$ = "OK (0.14 ksi < 1.2 ksi)"   *for Detail BB & BE*

$CheckFatigue_{BraceTwoSlant}$ = "OK (0.13 ksi < 1.2 ksi)"   *for Detail BD*

$CheckFatigue_{BraceThree}$ = "OK (0.1 ksi < 1.2 ksi)"   *for Detail BC*

Brace Members

$CheckFatigue_{Brace}$ = "OK (0.49 ksi < 7 ksi)"

▶ Drilled Shaft Calculations

▶ Anchor Bolt Calculation and Median Barrier Check Calculations

▶ Reinforcing Steel Bar List

▶ Quantity Calculations for Median Barrier

Drilled Shaft Design

Left Drilled Shaft Design Checks

$Check_{LtMassConcrete}$ = "OK"

$CheckSpacing_{LtLongReinf}$ = "OK"

$CheckCapacity_{LtLongReinf}$ = "OK"

$CheckShearTorsionComb_{Lt}$ = "OK"

$CheckMaxSpacing_{LtStirrup}$ = "OK"

$CheckInterFaceStrength$ = "OK"

Left Drilled Shaft Dimensions/Reinforcing

(DA) $L_{LtShaft} = 26.0\,ft$

(DB) $D_{LtShaft} = 4.5\,ft$

(DC) $d_{LtLongReinf}$ = "15 No. 11 bars evenly spaced"

(DD) $\#Spaces_{LtStirrup} = 30$

(DE) $Spacing_{LtShearStirrup} = 6.00 \cdot in$

Right Drilled Shaft Design Checks

$Check_{RtMassConcrete}$ = "OK"

$CheckSpacing_{RtLongReinf}$ = "OK"

$CheckCapacity_{RtLongReinf}$ = "OK"

$CheckShearTorsionComb_{Rt}$ = "OK"

$CheckMaxSpacing_{RtStirrup}$ = "OK"

Right Drilled Shaft Dimensions/Reinforcing

(FA) $L_{RtShaft} = 25.0\,ft$

(FB) $D_{RtShaft} = 4.5\,ft$

(FC) $d_{RtLongReinf}$ = "15 No. 11 bars evenly spaced"

(FD) $\#Spaces_{RtStirrup} = 30$

(FE) $Spacing_{RtShearStirrup} = 6.00 \cdot in$

Anchor Bolt Design

Anchor Bolt Lengths

(DF) $L_{embedment.anchorB} = 30 \cdot in$

(FF) $L_{RtAnchorEmbed} = 58 \cdot in$

Additional Anchor Bolt Checks

$CheckCapacity_{LtAnchor}$ = "OK"

$CheckBreakout_{LtAnchor}$ = "OK"

$Check_{NoNeedBearingPlate}$ = "OK"

$CheckCapacity_{RtAnchor}$ = "OK"

$CheckBreakout_{RtAnchor}$ = "OK"

$ClearSpacing_{bar.to.bar.right} = 6.8 \cdot in$

should be ~6" for concrete to flow from inside to outside of the drilled shaft reinforcing cage

$ClearSpacing_{bar.to.bolt.right} = 1.115 \cdot in$

should be ~1.5" for anchorage placement inside the drilled shaft reinforcement cage

Dual Upright Reinforcements

Median Barrier

$MedianBarrier_{Height} = 56 \cdot in$

$MedianBarrier_{Width} = 24 \cdot in$

$MedianBarrier_{Length} = 15 ft$

$Quantity_{Concrete.Barrier} = 5.185 \cdot yd^3$

$Quantity_{Steel.Barrier} = 4410 lbf$

(PR) $Num_{bar.long.Lt.Barrier} = 28$

(PV) $Spacing_{LtShearStirrup.Barrier} = 6 \cdot in$

$L_{LongBarrierEmbd}$ = "9' 1/2""

▸ MicroStation Data

Create MicroStation Text File

☑ Use same name as current data file

File Name GGI-5 OHS-1_New Input Matrix.txt Create MicroStation File

MicroStation Table Directions

1. Open the text menu and select "TableData" on the menu. This sets the text font for correct placement in the table.
2. Open the key-in dialog box and type in “include” and then add the full path to the text file.
3. Place the text using the text node provided in the Table. Some minor adjustment may be necessary to center the text.

Export Data to Excel Files for Microstation

Export Data

Note: A new analysis MUST be run after any change in program input.

Microstation Excel Tables Directions

1. Do not delete the original excel files in the folder.
2. Always close the excel files to keep the latest update per sign structure.
3. The Mathcad output is per structure. For multiple structures manually create another excel file.
4. To import the excel tables to Microstation use the Linked Data Manager (LDM) application. For more information refer to FDOT CAD Manual.

▸ Excel Data (Link Data Manager)

Disclaimer:

By using this program, you are agreeing in the following disclaimer: *No warranty, expressed or implied, is made by the Florida Department of Transportation and by the developers as to the accuracy and functioning of this program or the results it produce, nor shall the fact of distribution constitute any such warranty, and no responsibility is assumed by the Florida Department of Transportation and by the developers in any connection therewith..*

Plan View - Left Upright - Base Plate & Anchor Bolts

Coordinates for Drawings

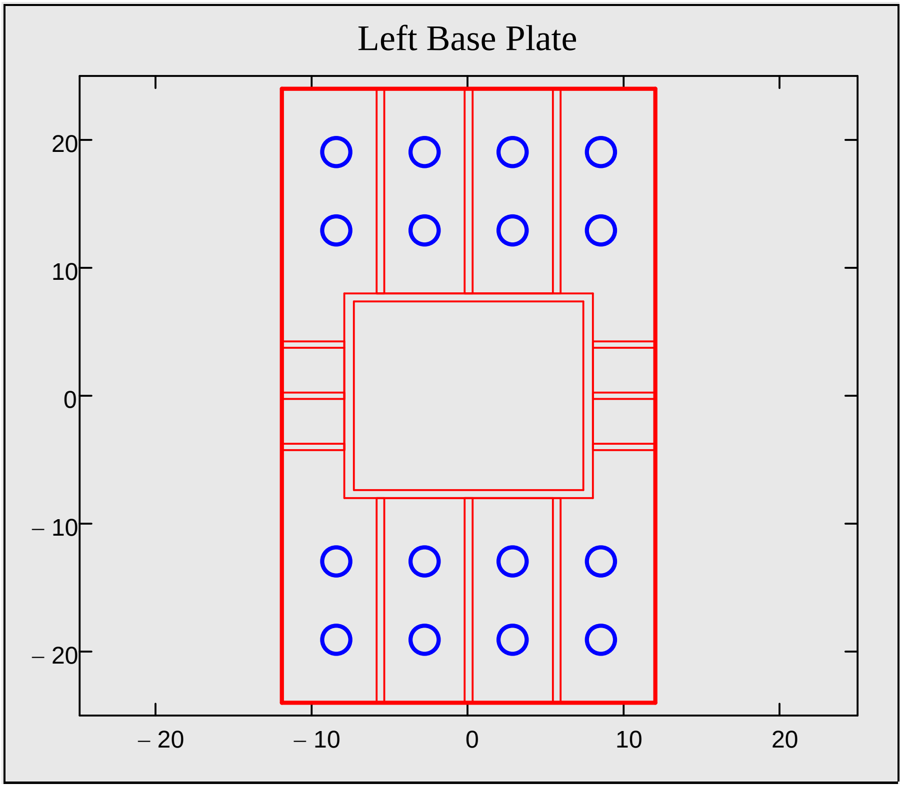


Diagram:

Anchor Bolts and Stiffener Plates Layouts at Base Plate.

$BK = 48 \cdot in$

$BM = 6.125 \cdot in$

$BN = 4.938 \cdot in$

$BP = 3.5 \cdot in$

$D_{Left.Upright} = 16 \cdot in$

$Bolt_{EquallySpacing} = 5.667 \cdot in$

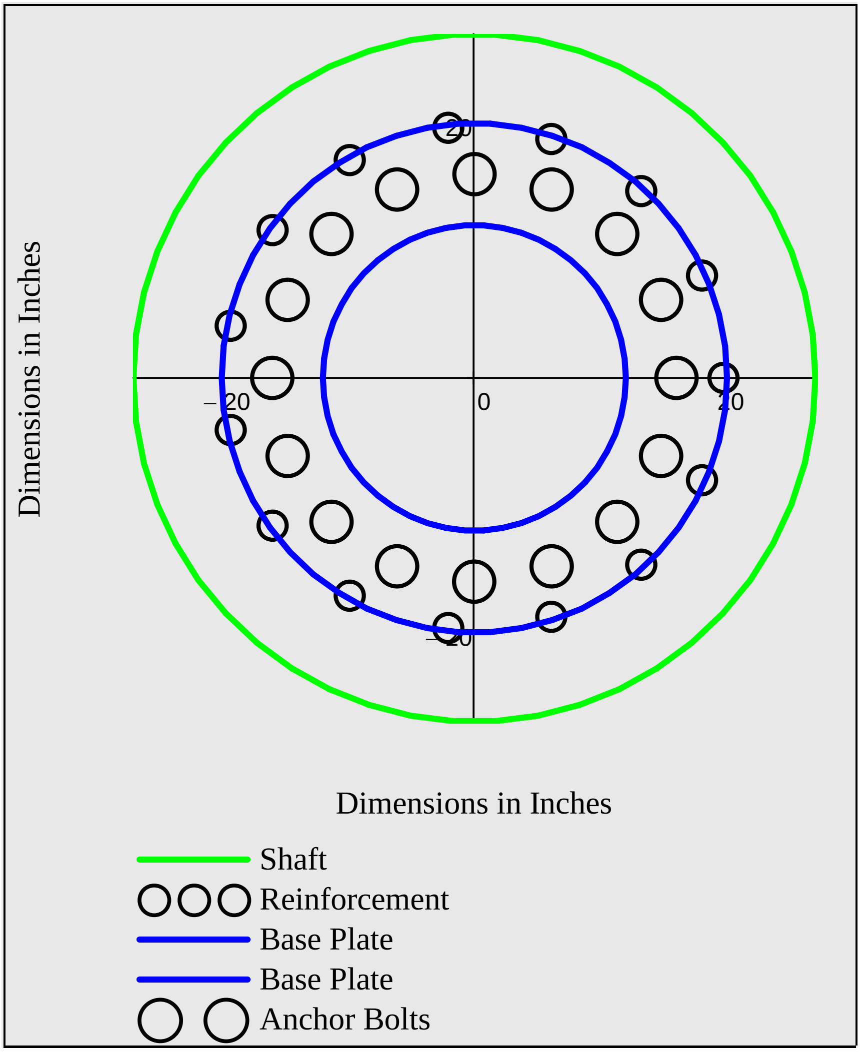
$t_{LtStiffener} = 0.5 \cdot in$

$\#AnchorLt = 16$

$D_{LtAnchor} = 1.5 \cdot in$

$D_{Anchor.NutC}\left(D_{LtAnchor}\right) = 2.75 \cdot in$

Plan View - Right Drilled Shaft, Base Plate, Anchor Bolts, & Reinforcing Steel



$Diameter_{base.pole} = 24 \cdot in$

$Diameter_{baseplate.pole} = 40 \cdot in$

$Diameter_{shaft} = 54 \cdot in$

$Diameter_{boltcircle.pole} = 32 \cdot in$

$Diameter_{rebar.circle} = 39.48 \cdot in$

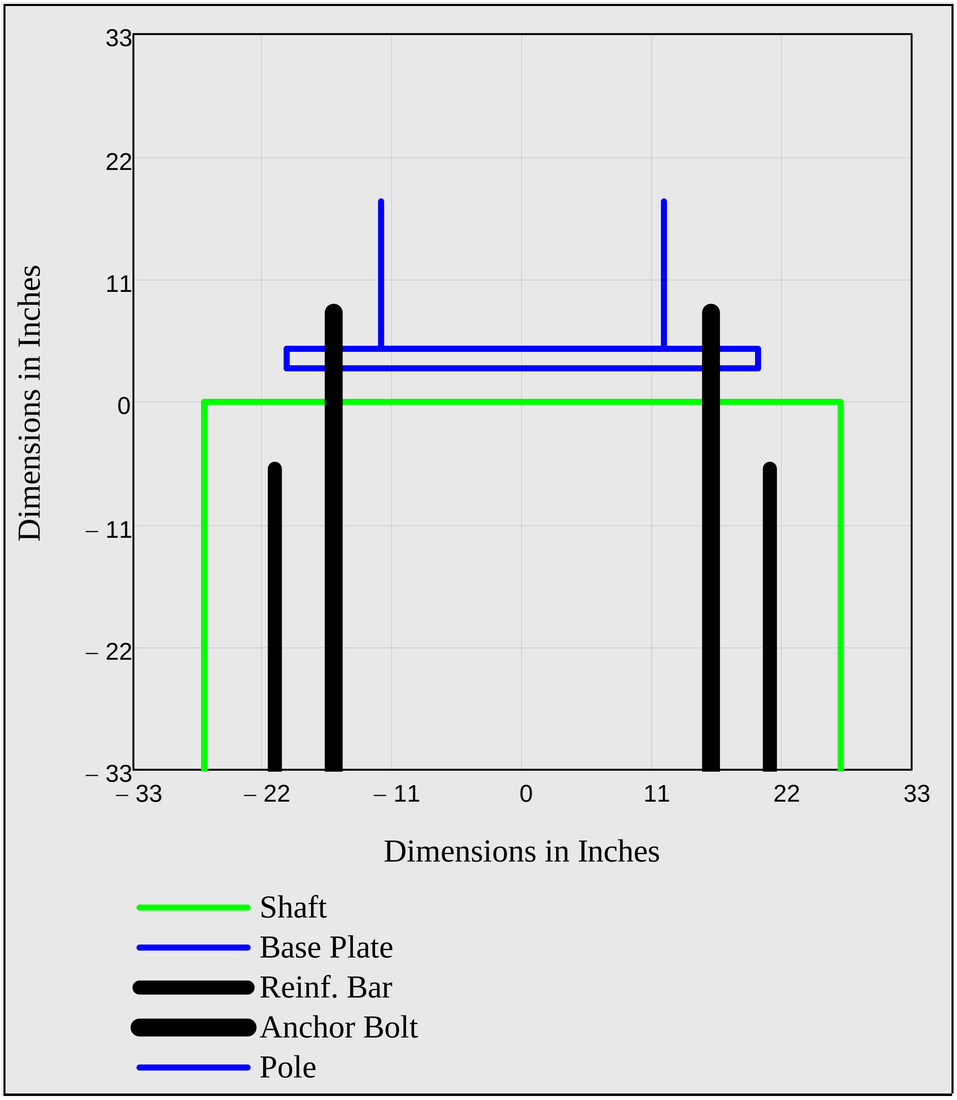
$\#AnchorRods = 16$

$\#BarsProvided = 15$

$ClearSpacing_{bar.to.bar.right} = 6.8 \cdot in$

$ClearSpacing_{bar.to.bolt.right} = 1.115 \cdot in$

Elevation View - Right Drilled Shaft, Base Plate, Anchor Bolts, & Reinforcing Steel



$Diameter_{base.pole} = 24 \cdot in$

$Diameter_{baseplate.pole} = 40 \cdot in$

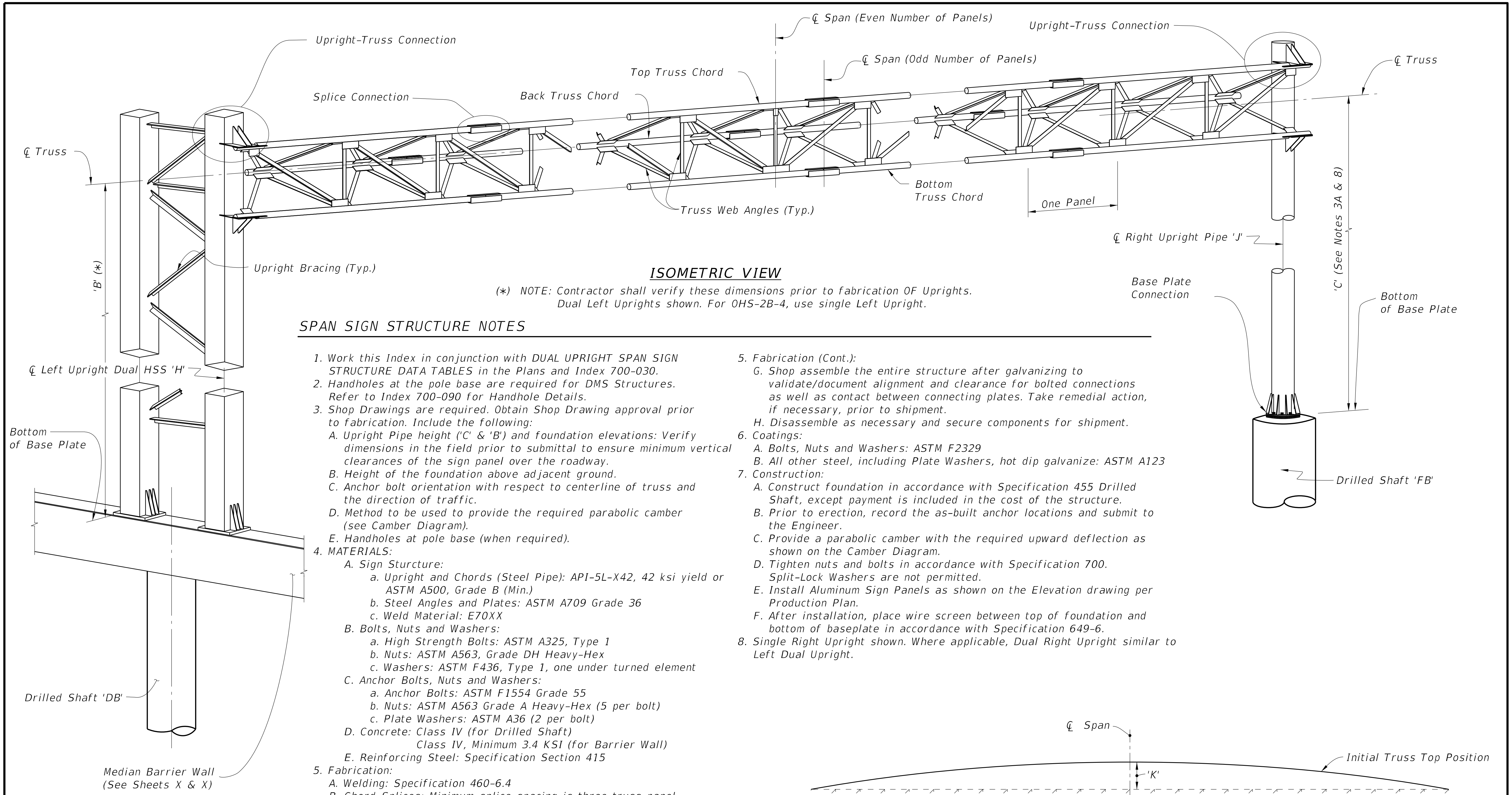
$t_{baseplate.pole} = 1.75 \cdot in$

$Diameter_{shaft} = 4.5 \cdot ft$

$Diameter_{boltcircle.pole} = 32 \cdot in$

$Diameter_{rebar.circle} = 39.5 \cdot in$

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

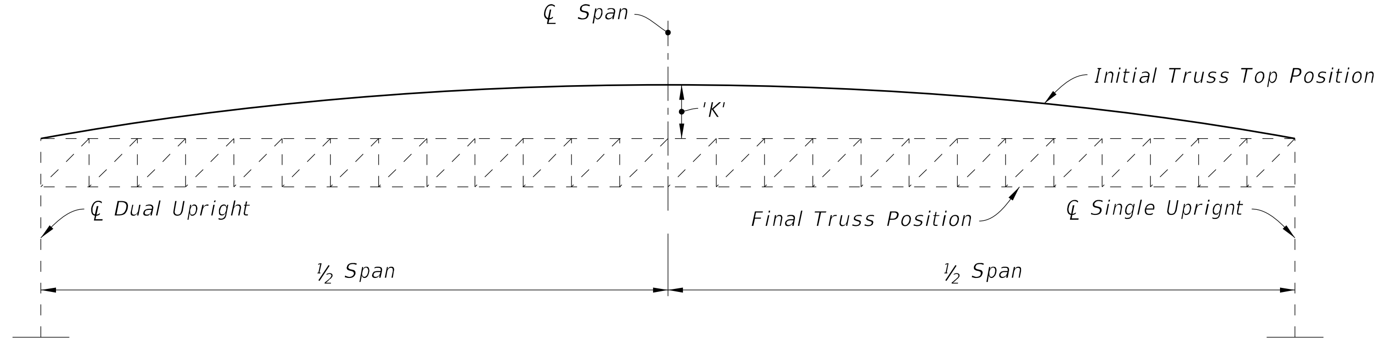


ISOMETRIC VIEW

(*) NOTE: Contractor shall verify these dimensions prior to fabrication OF Uprights.
Dual Left Uprights shown. For OHS-2B-4, use single Left Upright.

SPAN SIGN STRUCTURE NOTES

1. Work this Index in conjunction with DUAL UPRIGHT SPAN SIGN STRUCTURE DATA TABLES in the Plans and Index 700-030.
2. Handholes at the pole base are required for DMS Structures. Refer to Index 700-090 for Handhole Details.
3. Shop Drawings are required. Obtain Shop Drawing approval prior to fabrication. Include the following:
    A. Upright Pipe height ('C' & 'B') and foundation elevations: Verify dimensions in the field prior to submittal to ensure minimum vertical clearances of the sign panel over the roadway.
    B. Height of the foundation above adjacent ground.
    C. Anchor bolt orientation with respect to centerline of truss and the direction of traffic.
    D. Method to be used to provide the required parabolic camber (see Camber Diagram).
    E. Handholes at pole base (when required).
4. MATERIALS:
    A. Sign Sturcture:
        a. Upright and Chords (Steel Pipe): API-5L-X42, 42 ksi yield or ASTM A500, Grade B (Min.)
        b. Steel Angles and Plates: ASTM A709 Grade 36
        c. Weld Material: E70XX
    B. Bolts, Nuts and Washers:
        a. High Strength Bolts: ASTM A325, Type 1
        b. Nuts: ASTM A563, Grade DH Heavy-Hex
        c. Washers: ASTM F436, Type 1, one under turned element
    C. Anchor Bolts, Nuts and Washers:
        a. Anchor Bolts: ASTM F1554 Grade 55
        b. Nuts: ASTM A563 Grade A Heavy-Hex (5 per bolt)
        c. Plate Washers: ASTM A36 (2 per bolt)
    D. Concrete: Class IV (for Drilled Shaft)
        Class IV, Minimum 3.4 KSI (for Barrier Wall)
    E. Reinforcing Steel: Specification Section 415
5. Fabrication:
    A. Welding: Specification 460-6.4
    B. Chord Splices: Minimum splice spacing is three truss panel lengths apart and three truss panel lengths from the uprights. Chord Splices may be either the Standard Splice or the Alternate Splice but not both on the same structure.
    C. Upright splice: Not allowed
    D. Structural bolt hole diameters: Bolt diameter plus $\frac{1}{16}$".
    E. Anchor bolt hole diameters: Bolt diameter plus $\frac{1}{2}$".
    F. Hot Dip Galvanize after fabrication.
5. Fabrication (Cont.):
    G. Shop assemble the entire structure after galvanizing to validate/document alignment and clearance for bolted connections as well as contact between connecting plates. Take remedial action, if necessary, prior to shipment.
    H. Disassemble as necessary and secure components for shipment.
6. Coatings:
    A. Bolts, Nuts and Washers: ASTM F2329
    B. All other steel, including Plate Washers, hot dip galvanize: ASTM A123
7. Construction:
    A. Construct foundation in accordance with Specification 455 Drilled Shaft, except payment is included in the cost of the structure.
    B. Prior to erection, record the as-built anchor locations and submit to the Engineer.
    C. Provide a parabolic camber with the required upward deflection as shown on the Camber Diagram.
    D. Tighten nuts and bolts in accordance with Specification 700. Split-Lock Washers are not permitted.
    E. Install Aluminum Sign Panels as shown on the Elevation drawing per Production Plan.
    F. After installation, place wire screen between top of foundation and bottom of baseplate in accordance with Specification 649-6.
8. Single Right Upright shown. Where applicable, Dual Right Upright similar to Left Dual Upright.



CAMBER DIAGRAM

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
GENERAL NOTES

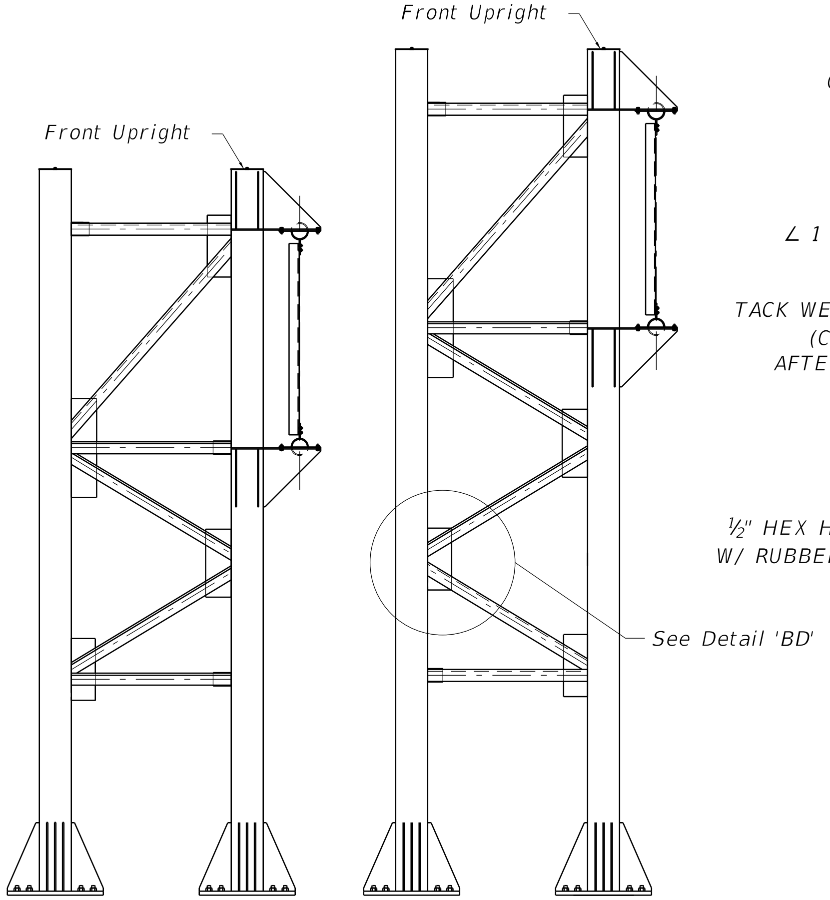
PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

REF. DWG. NO.

SHEET NO.
S-X

RD647DC 8/20/2019 2:14:18 PM C:\Projects\42835855201\struct\SignStructSpan03.dgn

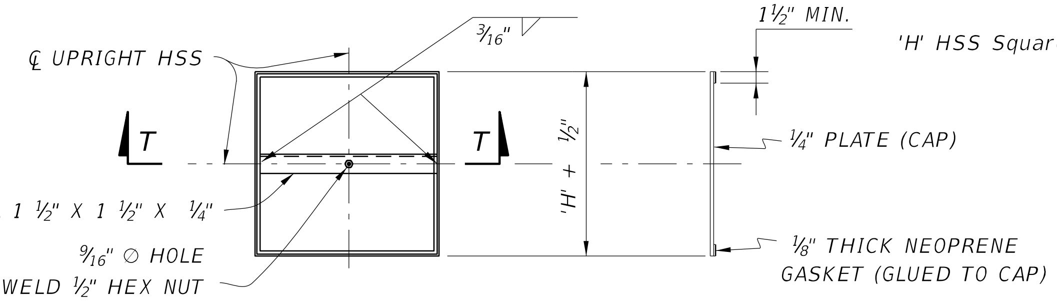
Notes:
1. Align Gussett Plates with ℄ HSS Square Tube Upright.
2. Install Angles facing traffic and Gussett Plates away from traffic.



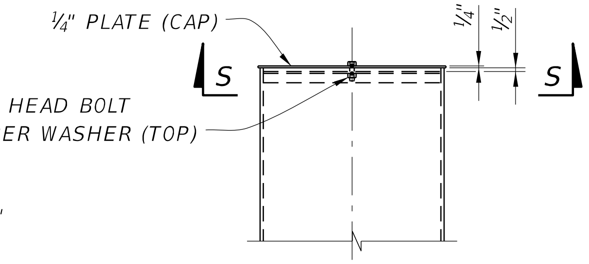
N=2 PANELS

N=3 PANELS

DUAL UPRIGHT BRACE CONFIGURATIONS FOR 2 or 3 PANELS



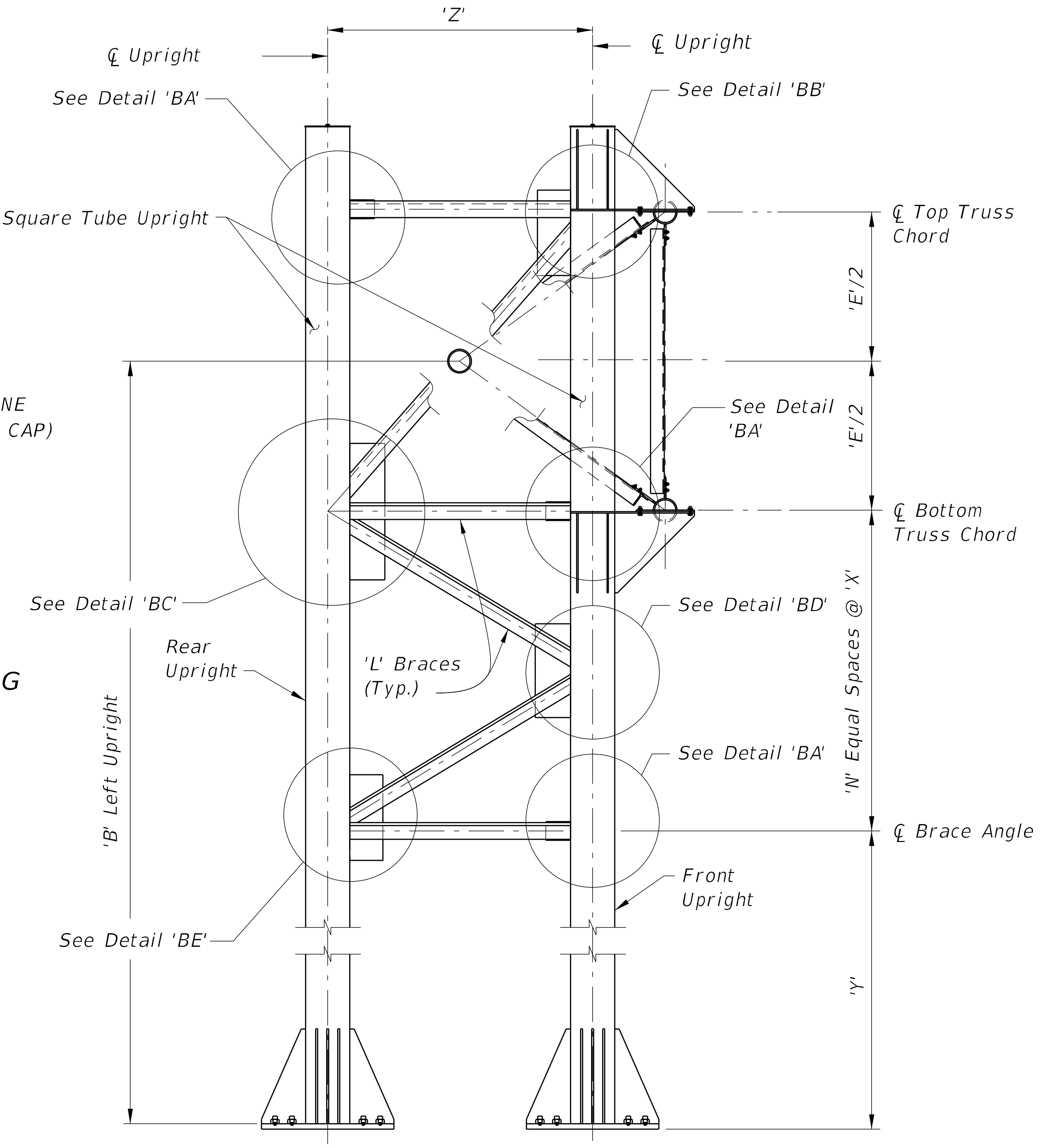
SECTION S-S
(SHOWING CAP PLATE ONLY)



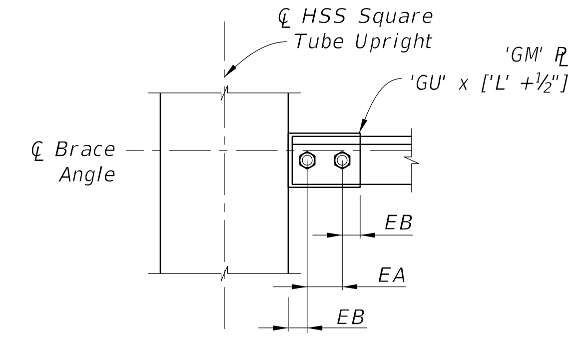
UPRIGHT CAP DETAIL SECTION T-T

BOLT TABLE OF SPACING AND EDGE DISTANCE

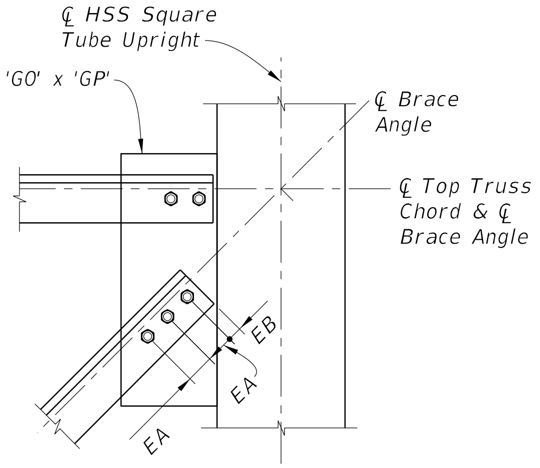
Bolt Size	Distance	
	EA	EB
1¼" Ø	4⅜"	2¼"
1" Ø	3½"	1¾"
⅞" Ø	3"	1½"
¾" Ø	2½"	1¼"
⅝" Ø	2¼"	1⅛"



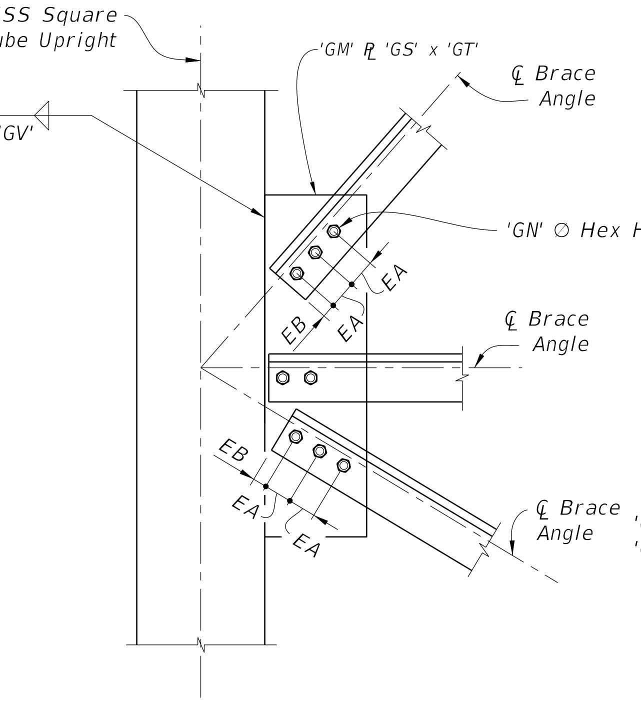
DUAL UPRIGHT ELEVATION
(2 Panel Details shown, 3 Panel Details similar see Note 1 & 2.)



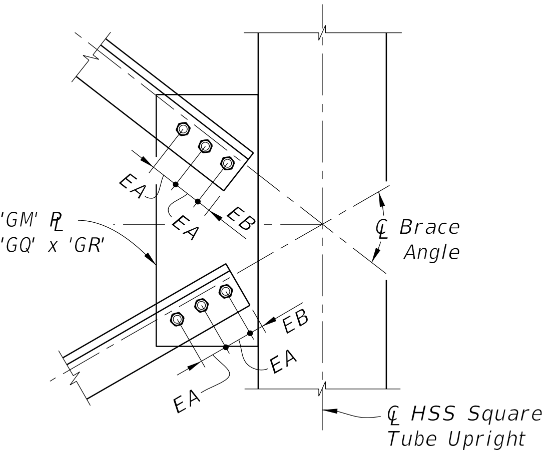
DETAIL 'BA'



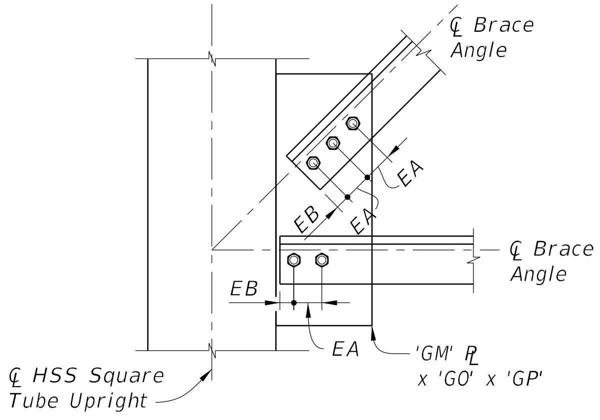
DETAIL 'BB'



DETAIL 'BC'



DETAIL 'BD'



DETAIL 'BE'

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

REVISIONS					
DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

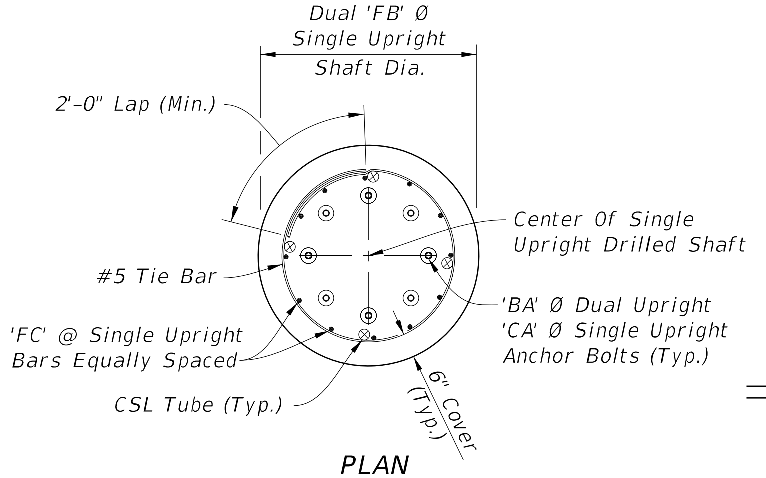
DRAWN BY:	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		
CHECKED BY:			
DESIGNED BY:	ROAD NO.	COUNTY	FINANCIAL PROJECT ID
CHECKED BY:	SR 9A	MIAMI-DADE	428358-5-52-01

SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
DUAL UPRIGHT ELEVATION

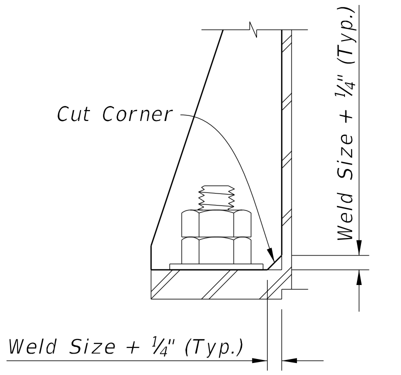
PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

REF. DWG. NO.

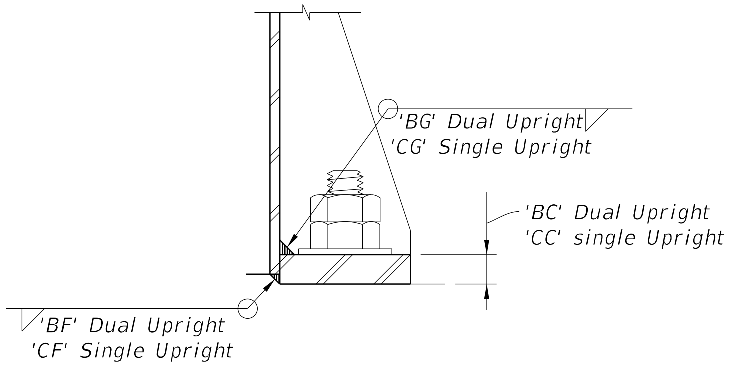
SHEET NO.
S-X



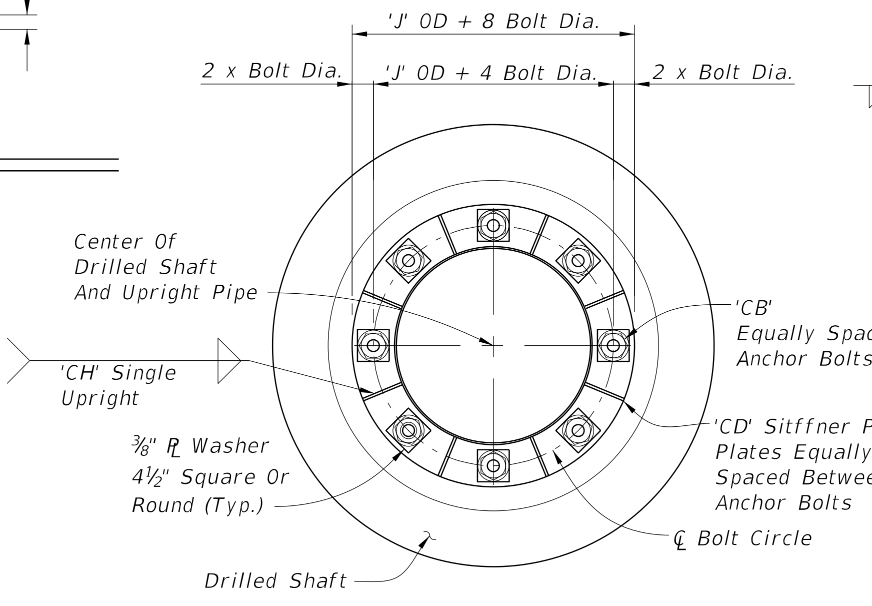
PLAN



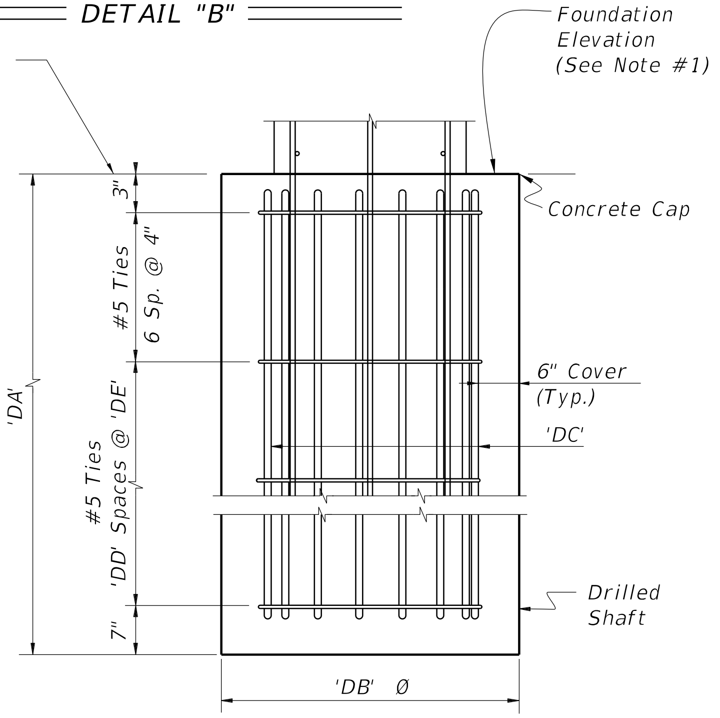
DETAIL "A"



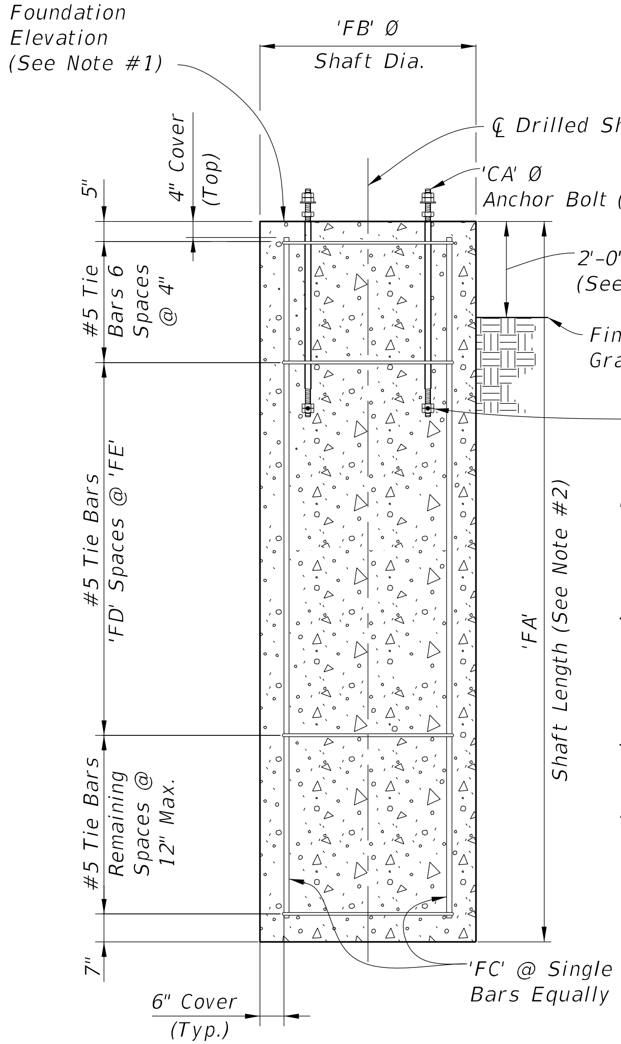
DETAIL "B"



SINGLE POST UPRIGHT DRILLED SHAFT PLAN



DUAL POST UPRIGHT DRILLED SHAFT ELEVATION



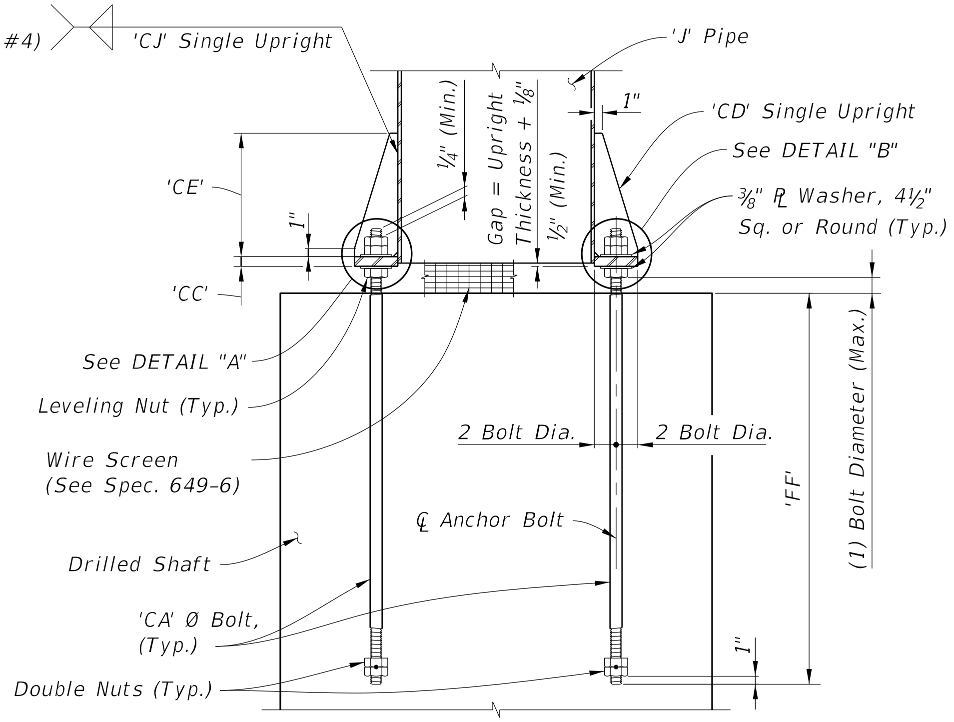
ELEVATION

NOTES:

1. See Traffic Plans for elevation at top of Foundation.
2. Install Drilled Shaft with a 2'-0" minimum from top elevation of the drilled shaft to the finished grade, unless specified otherwise in the plans.
3. The shaft length is based on 2'-0" height above finished grade.
4. Wrap fillet weld around the stiffner termination on the tube wall (Typ).

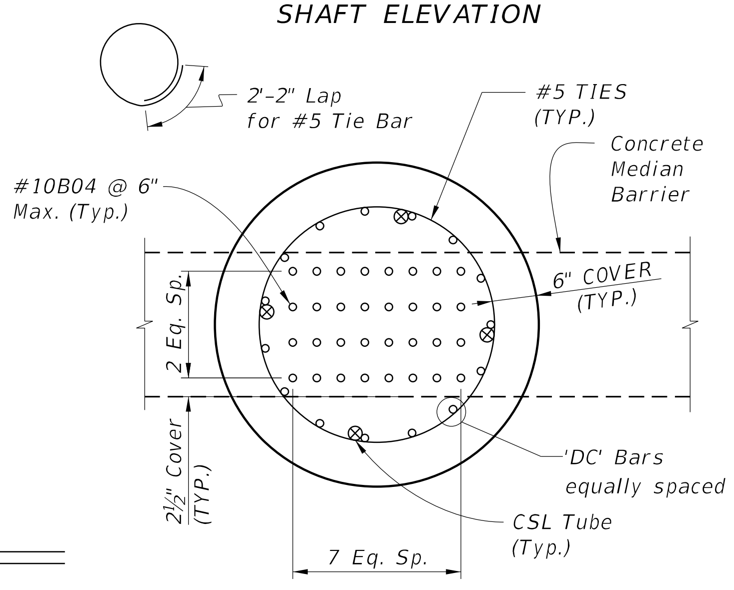
SINGLE POST UPRIGHT DRILLED SHAFT

FOUNDATION



SINGLE POST UPRIGHT DRILLED SHAFT ELEVATION

BASE PLATE CONNECTION



DUAL POST UPRIGHT DRILLED SHAFT PLAN VIEW

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

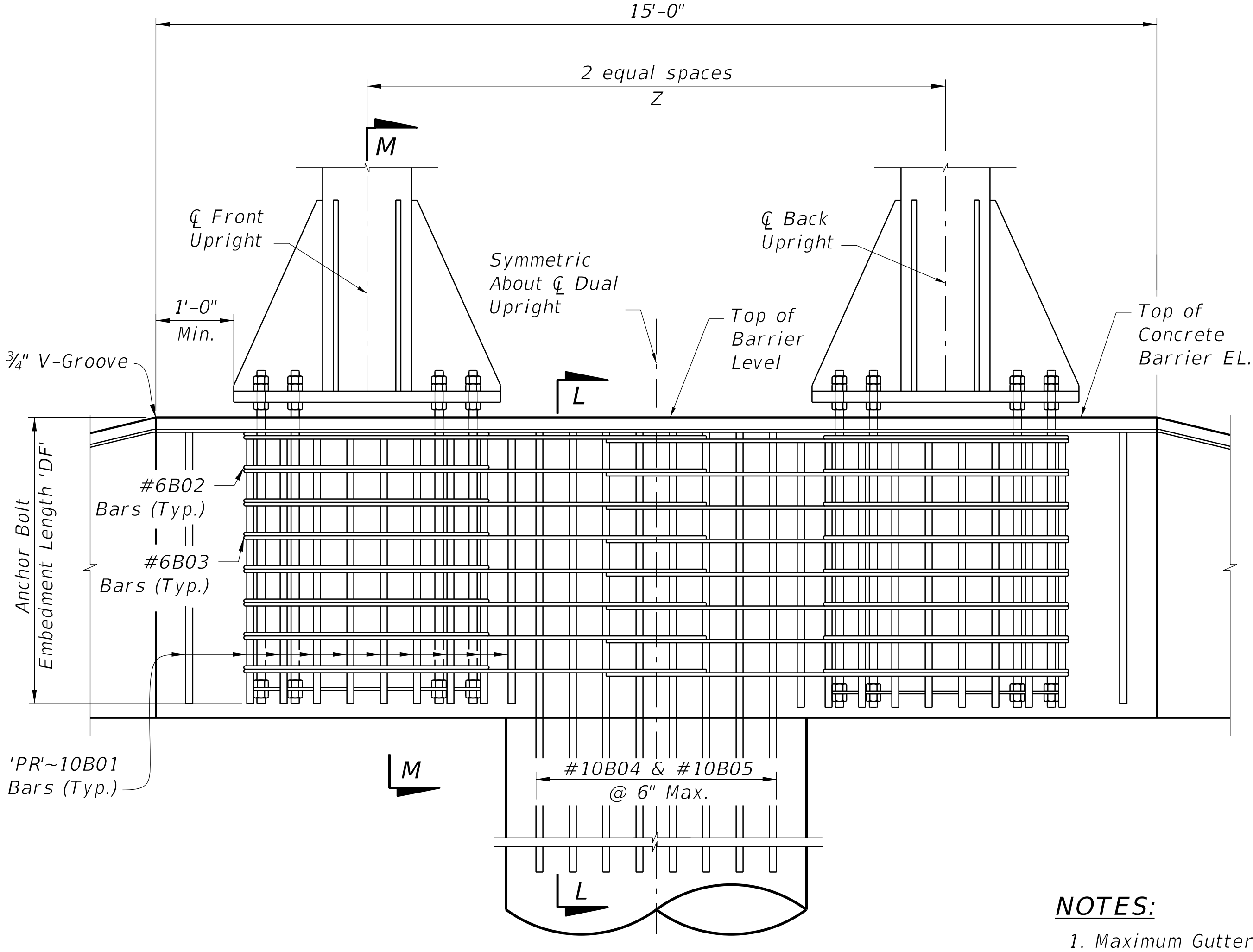
SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
DRILLED SHAFT DETAILS

PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

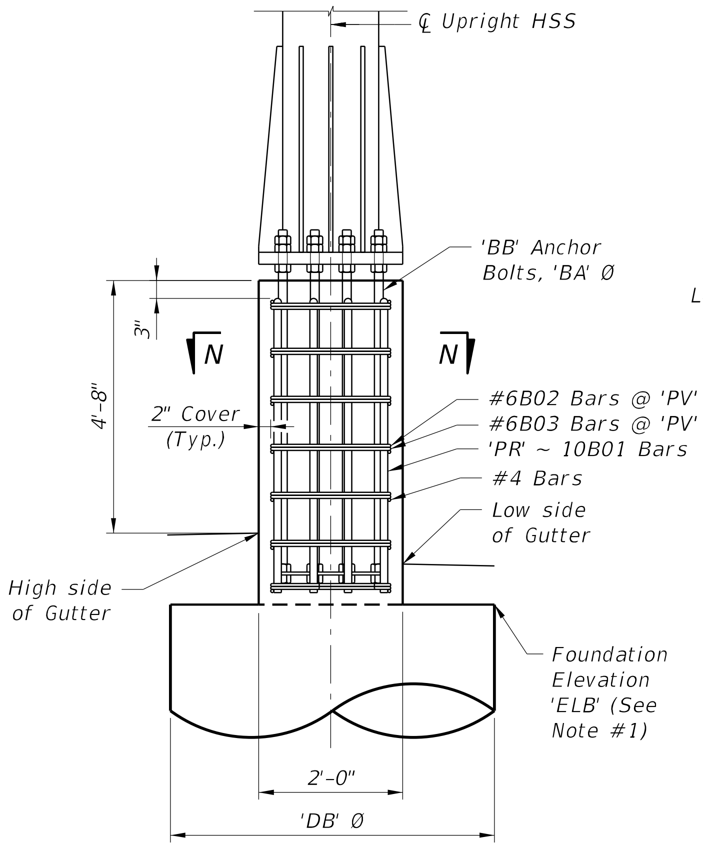
REF. DWG. NO.

SHEET NO.
S-X

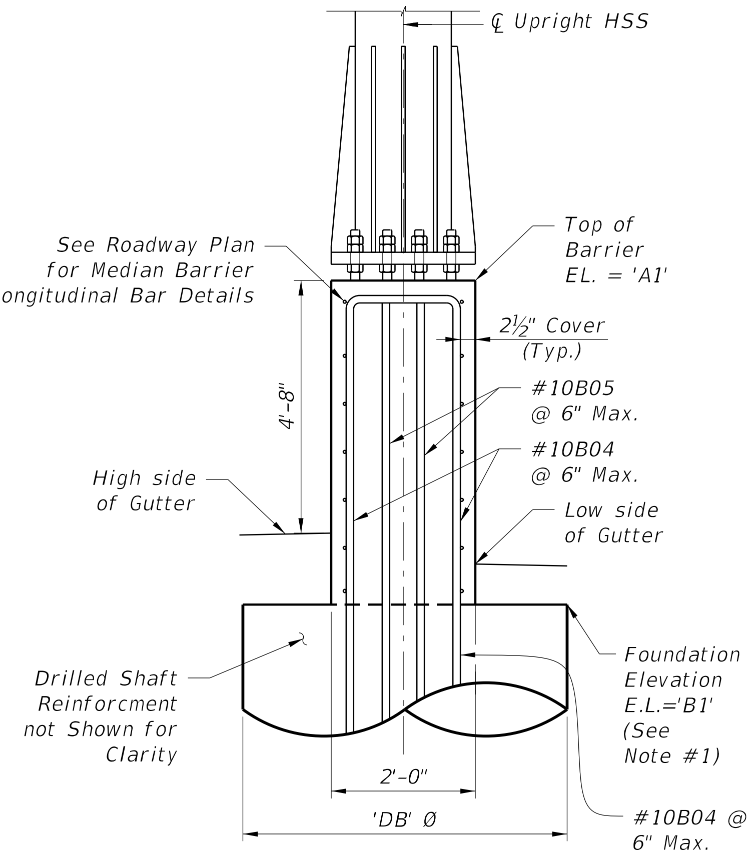
RD647DC 8/20/2019 2:18:17 PM C:\Projects\42835855201\struct\SignStructSpan05.dgn



ELEVATION



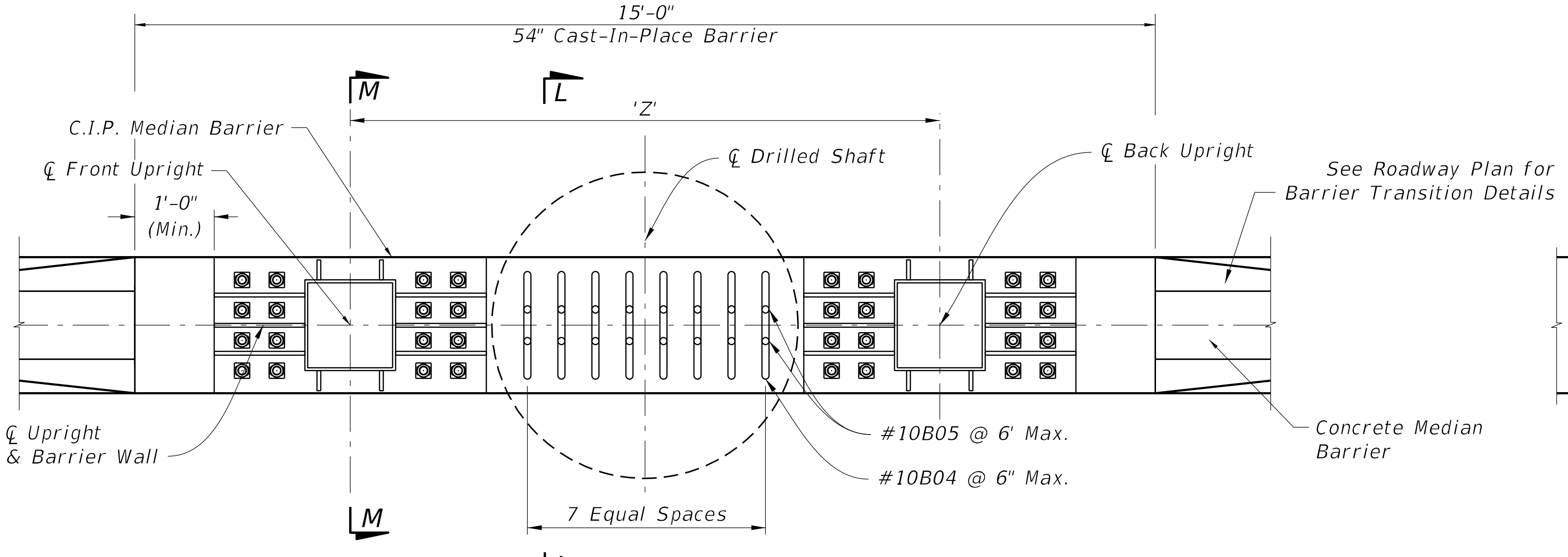
SECTION M-M



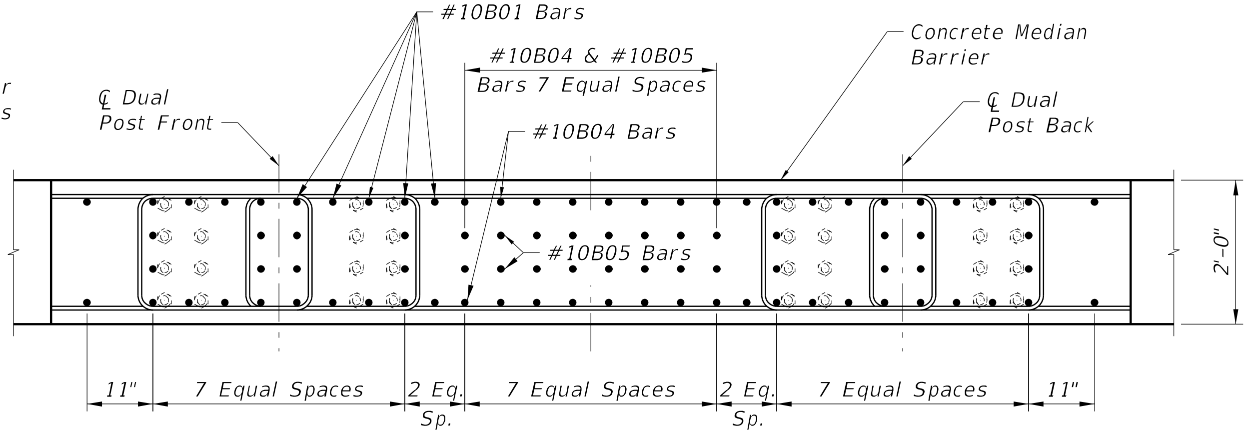
SECTION L-L

NOTES:

1. Maximum Gutter grade separation is 9".
2. See Index 521-001 for Median Barrier Wall and Transition details.



PLAN



SECTION N-N

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
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DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
MEDIAN BARRIER DETAILS

PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

REF. DWG. NO.

SHEET NO.
S-X

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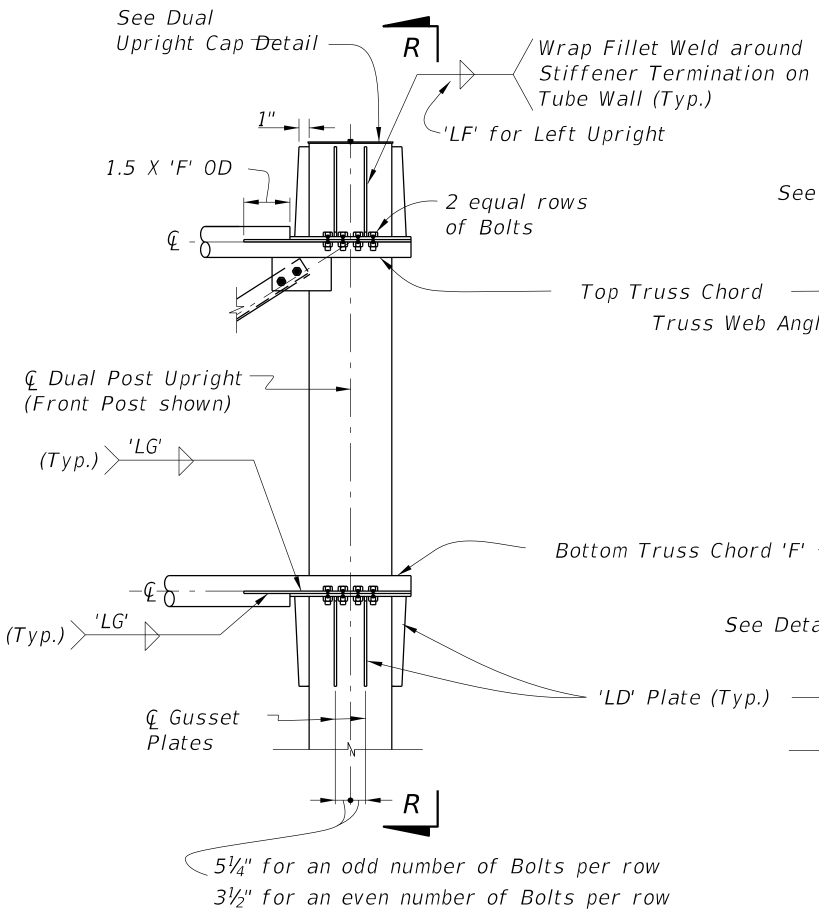
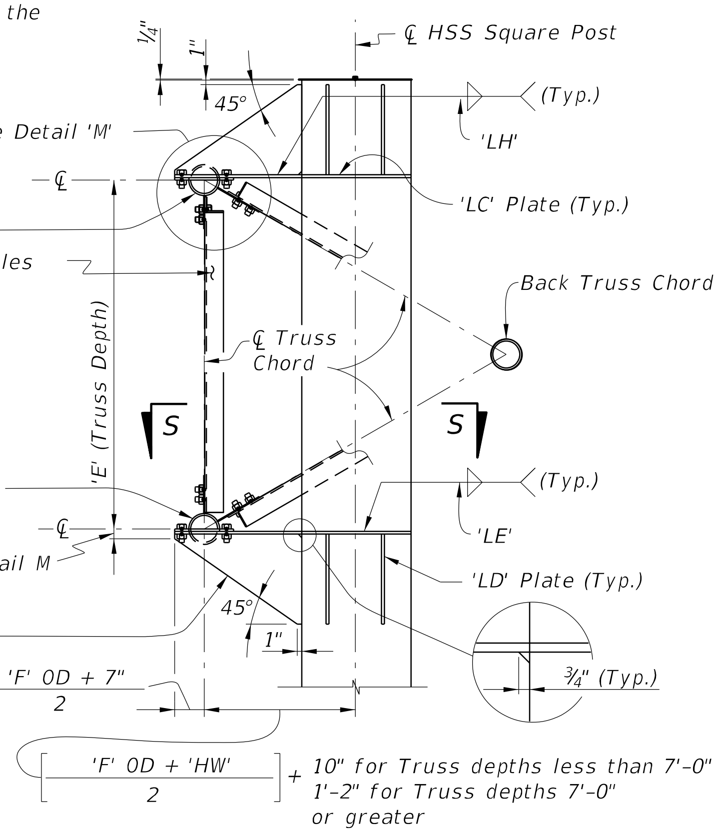


DUAL POST UPRIGHT-TRUSS CONNECTION DETAIL

(Web Members from Back Truss Chord omitted for clarity)

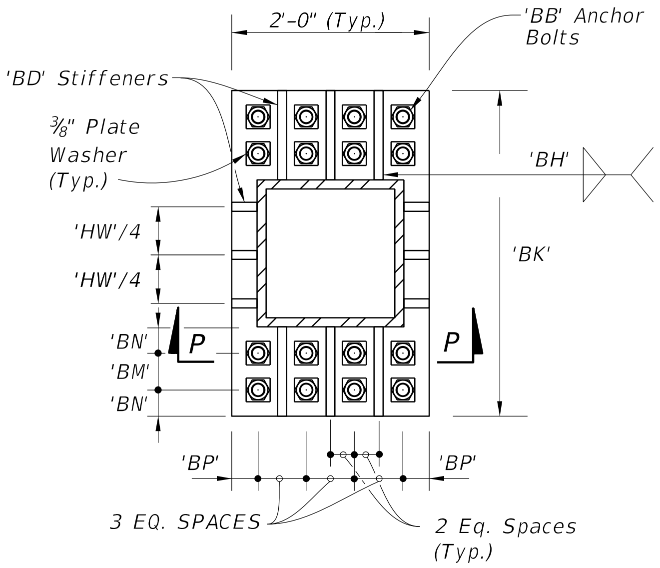


VIEW R-R

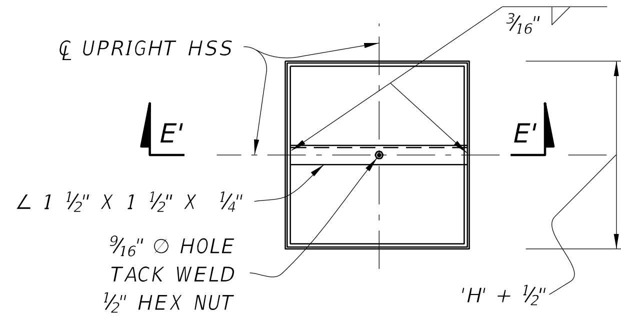
(Back Upright and Braces omitted for Clarity)

NOTE:

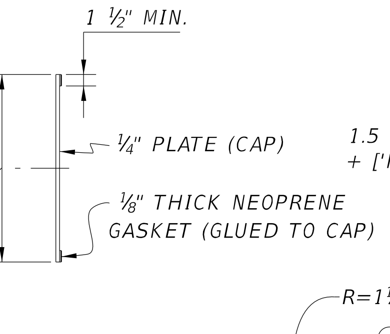
Abbreviation
OD ~ Outside Diameter



DUAL POST UPRIGHT BASE PLATE PLAN VIEW

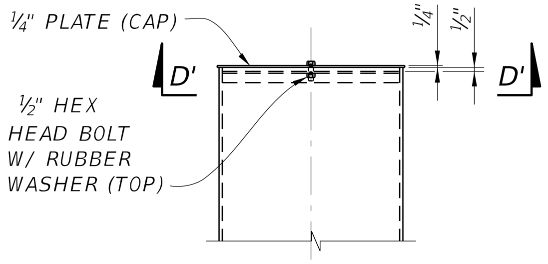


SECTION D'-D'

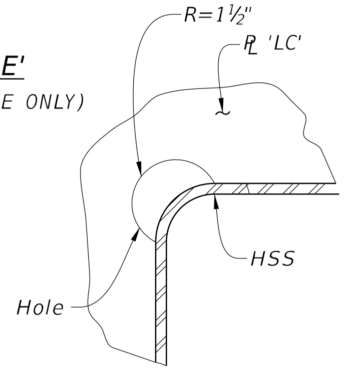


SECTION E'-E'

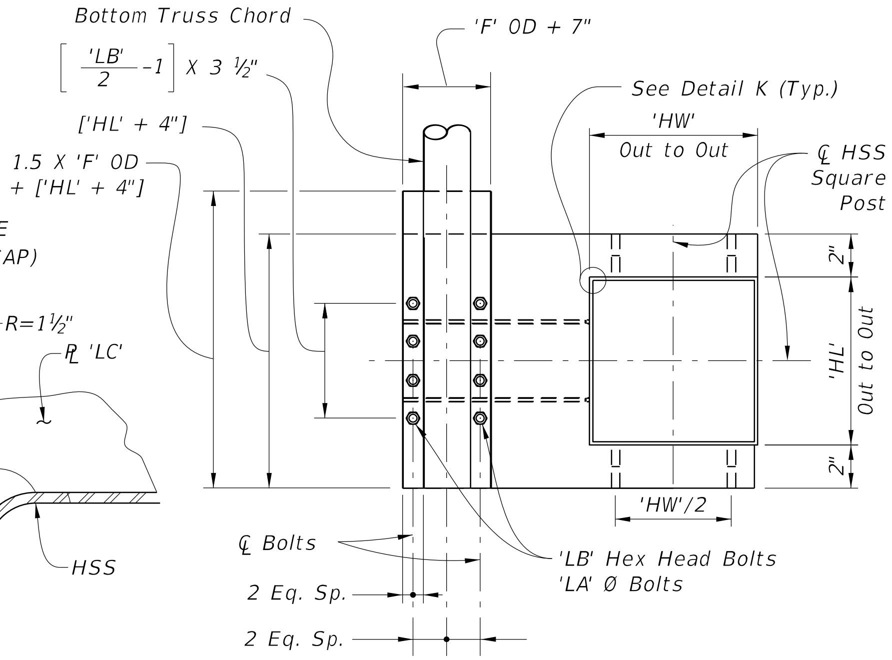
(SHOWING CAP PLATE ONLY)



DUAL POST UPRIGHT CAP DETAIL

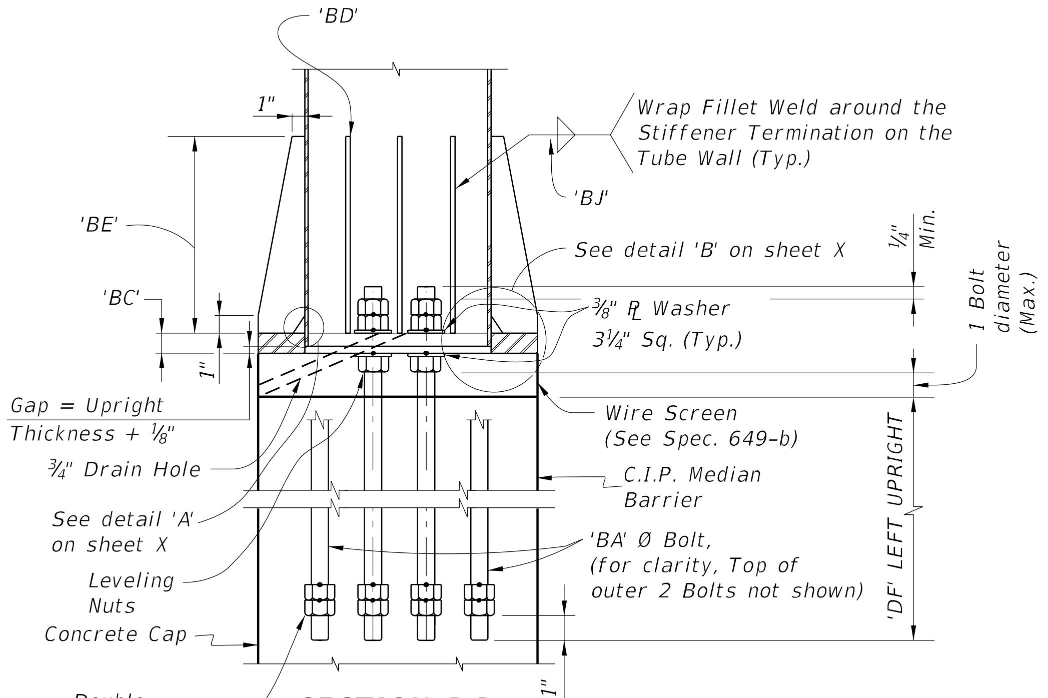


DETAIL K



SECTION S-S

(with Gusset Plate and Angles omitted for Clarity)



SECTION P-P

(Dual Upright)

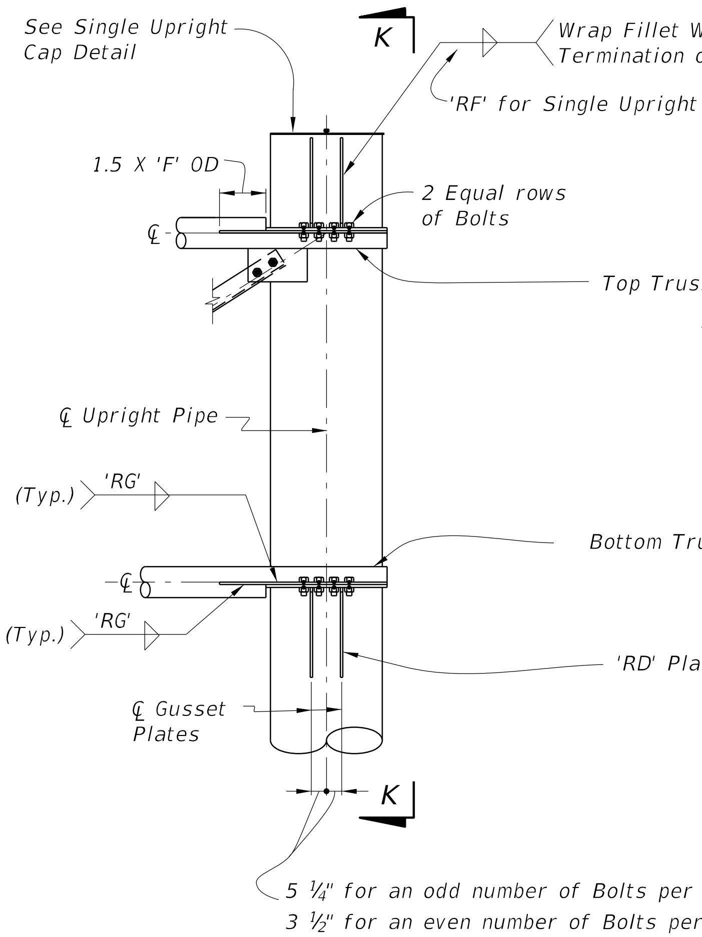
NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

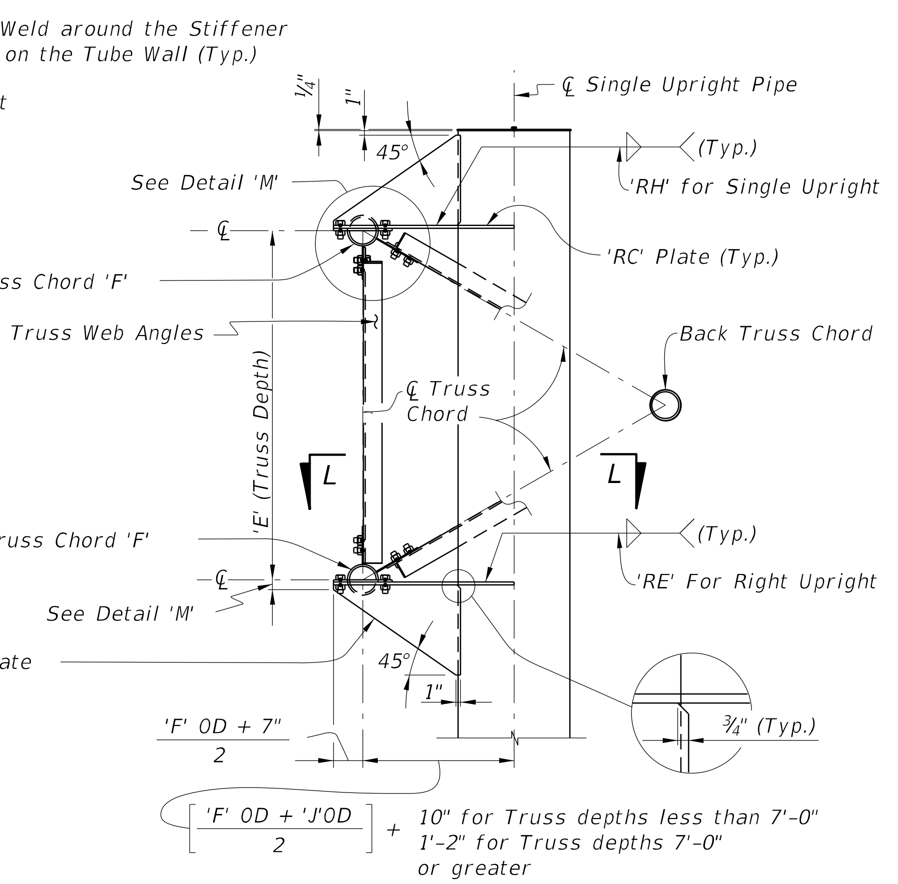
DRAWN BY:	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		SHEET TITLE: DUAL POST UPRIGHT SPAN SIGN STRUCTURE DUAL UPRIGHT DETAILS	REF. DWG. NO.
CHECKED BY:				
DESIGNED BY:	ROAD NO.	COUNTY	FINANCIAL PROJECT ID	PROJECT NAME:	SHEET NO.
CHECKED BY:	SR 9A	MIAMI-DADE	428358-5-52-01	GOLDEN GLADES INTERCHANGE SR 9A/I-95 N. OF BISCAYNE RIVER CANAL	S-X

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

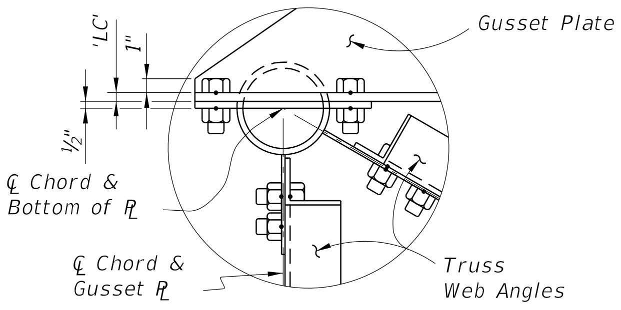


SINGLE POST UPRIGHT-TRUSS CONNECTION DETAIL

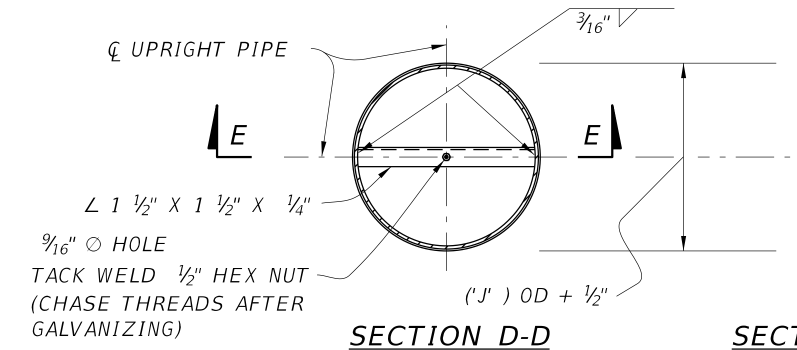
(Web Members from Back Truss Chord omitted for clarity)



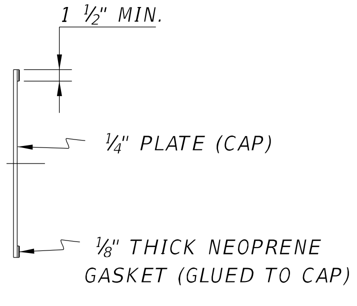
VIEW K-K



DETAIL M

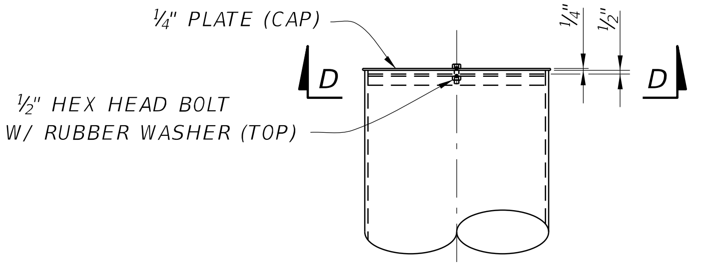


SECTION D-D

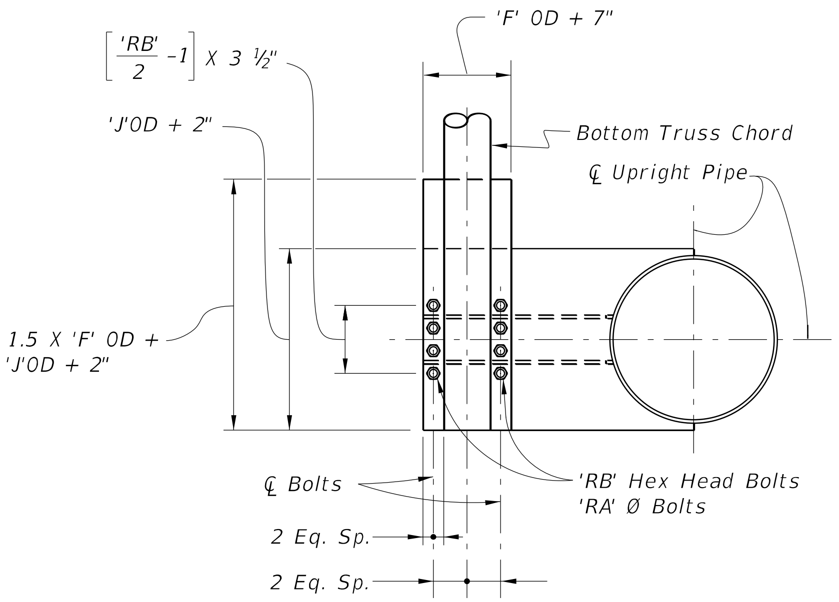


SECTION E-E

(SHOWING CAP PLATE ONLY)



SINGLE POST UPRIGHT CAP DETAIL



SECTION L-L

(WITH GUSSET PLATE AND ANGLES OMITTED FOR CLARITY)

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

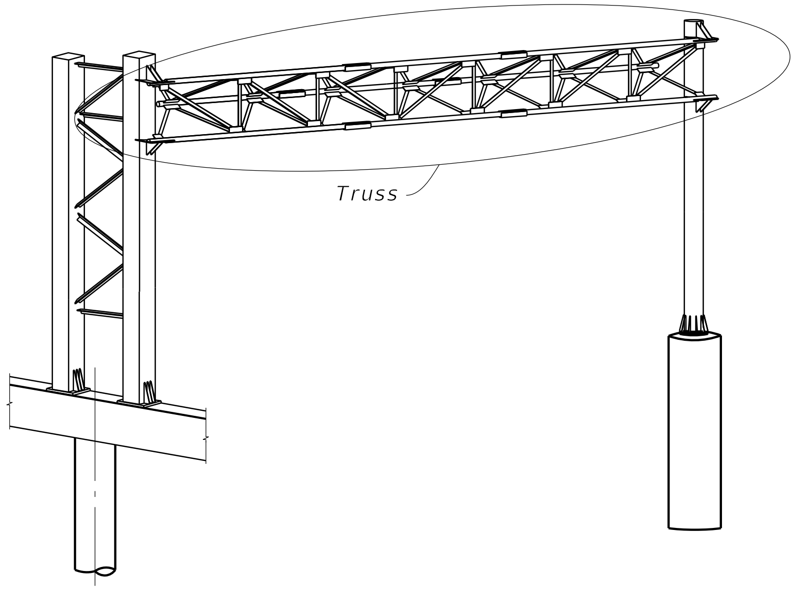
SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
SINGLE UPRIGHT TRUSS-CONNECTION DETAILS

PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

REF. DWG. NO.

SHEET NO.
S-X

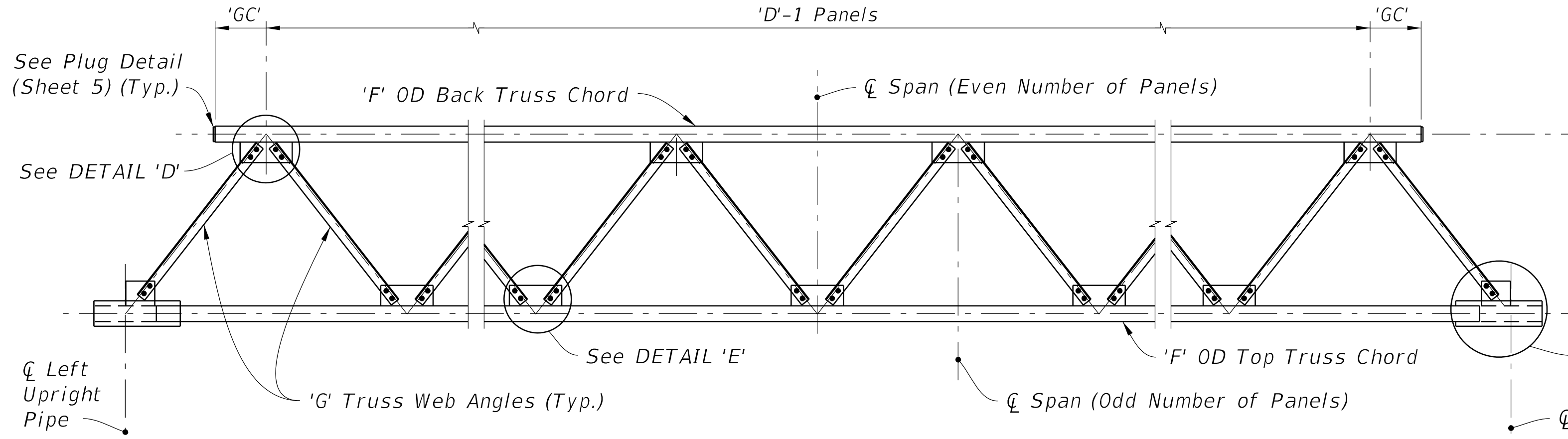
RD647DC 10/16/2019 8:41:06 AM C:\Projects\42835855201\struct\SignStructSpan08.dgn



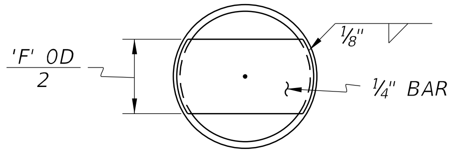
DUAL POST SPAN SIGN ASSEMBLY

NOTES:

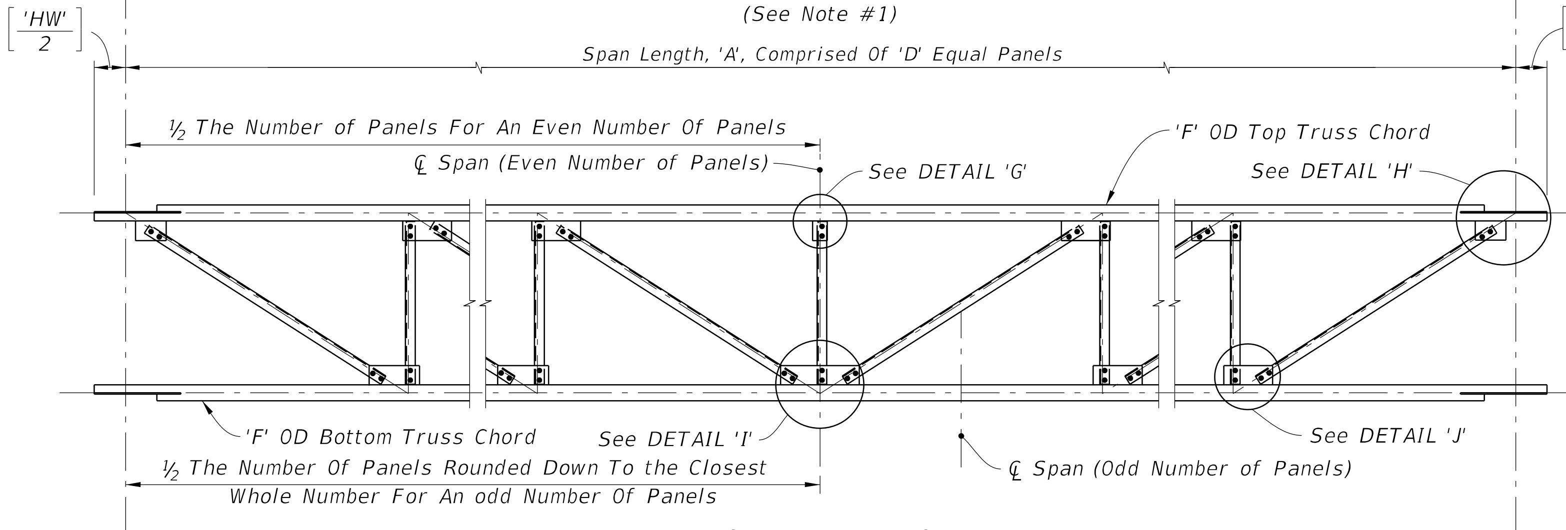
1. Out-of-plane members are not shown for clarity.
2. Back truss chord and attached angles are not shown for clarity.
3. Wrap fillet weld around plate termination on the tube wall.
4. For EA & EB values, see BOLT TABLE OF SPACING and EDGE DISTANCE on Sheet X.



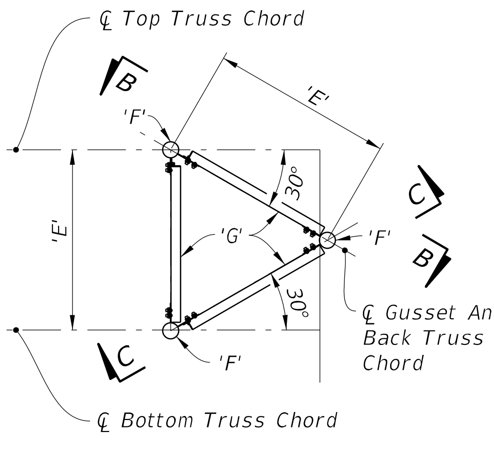
Section B-B (Section C-C Similar)
(See Note #1)



PLUG DETAIL
(Each End of Back Truss Chord)

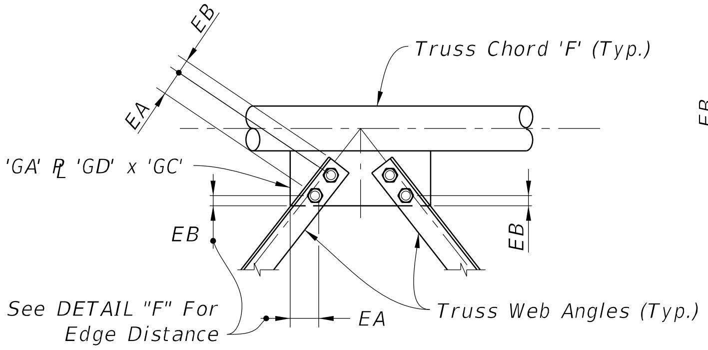


FRONT ELEVATION
(See Note #2)

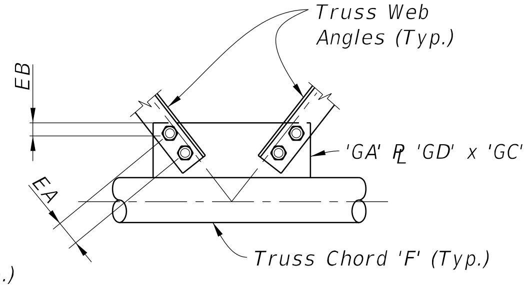


SIDE ELEVATION

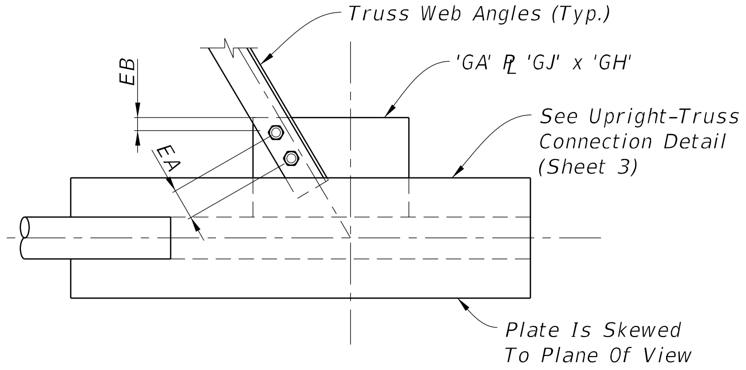
TRUSS



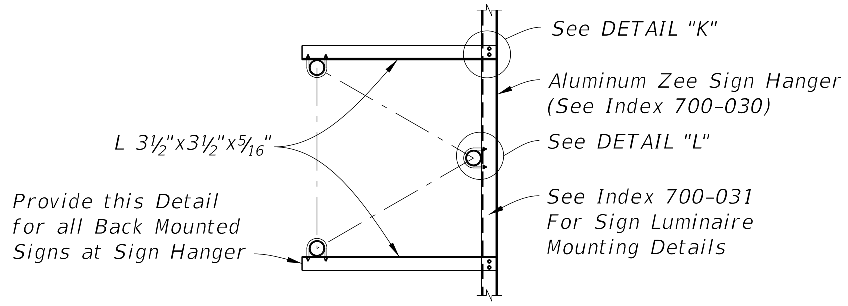
DETAIL 'D'



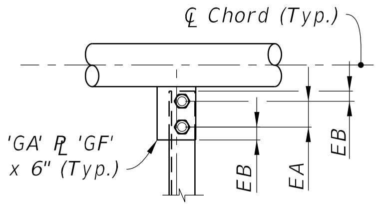
DETAIL 'E'



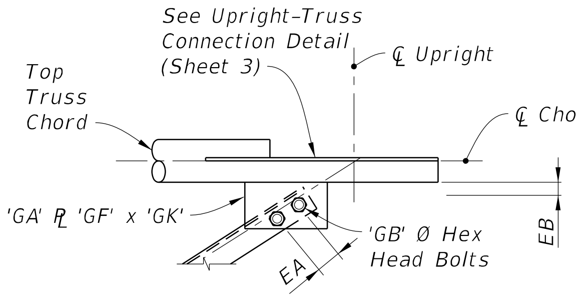
DETAIL 'F'



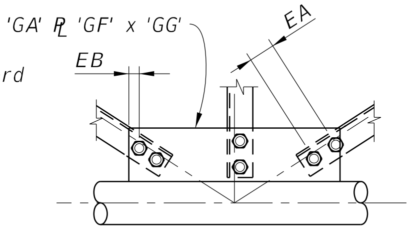
BACK-SIDE SIGN MOUNTING



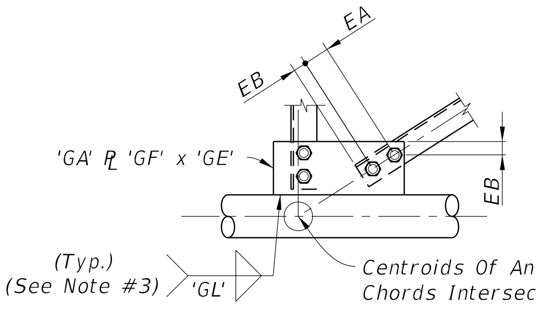
DETAIL 'G'



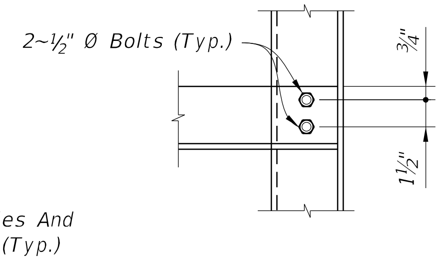
DETAIL 'H'



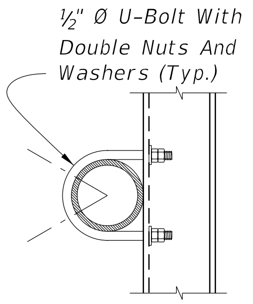
DETAIL 'I'



DETAIL 'J'



DETAIL 'K'



DETAIL 'L'

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

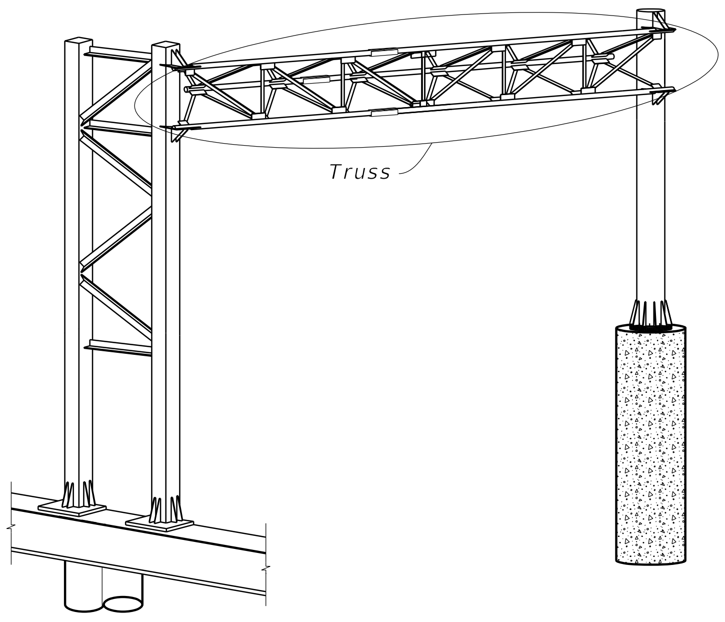
SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
TRUSS DETAILS (1 OF 2)

PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

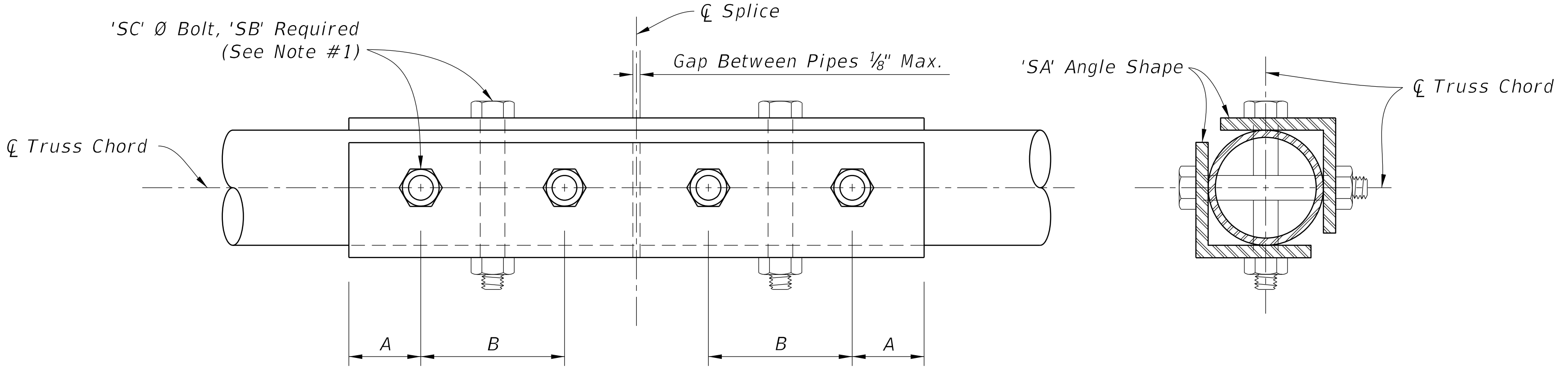
REF. DWG. NO.

SHEET NO.
S-X

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE



DUAL POST SPAN SIGN ASSEMBLY



FRONT ELEVATION

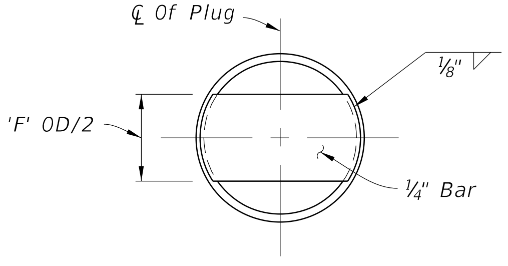
SIDE ELEVATION

SPLICE CONNECTION NOTE:

1. Only 6 bolts are shown in detail for clarity. (One Half Each End Of Splice)

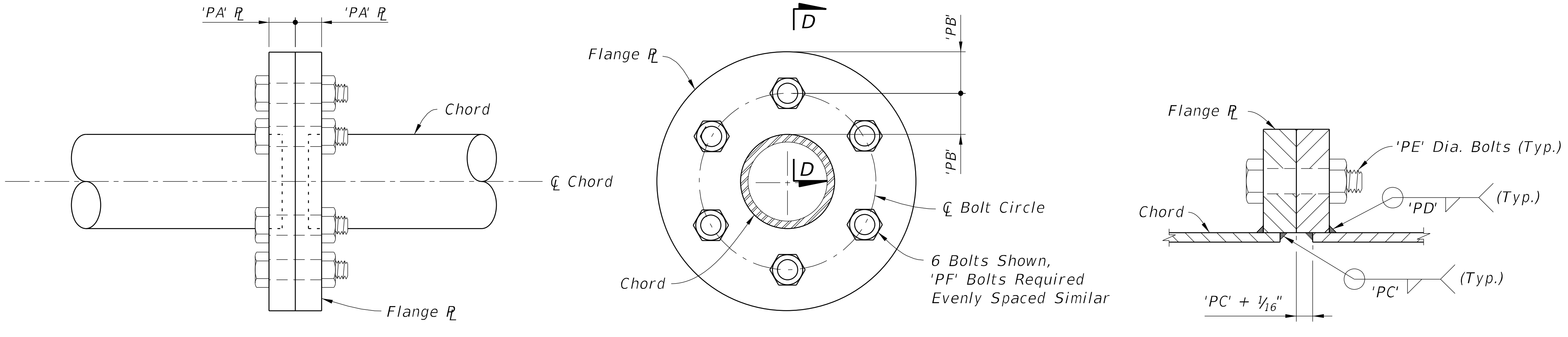
Bolt Diameter (in.)	Distance (in.)	
	A	B
1	1¾	3½
⅞	1½	3
¾	1¼	2½

SPLICE CONNECTION DETAIL



(Each End Of Back Truss Chord)

TRUSS PLUG DETAIL



FRONT ELEVATION

SIDE ELEVATION

SECTION D-D

ALTERNATE SPLICE CONNECTION DETAIL

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
CHECKED BY:
DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
TRUSS DETAILS (2 OF 2)

PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

REF. DWG. NO.

SHEET NO.
S-X

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

DUAL POST UPRIGHT SPAN SIGN STRUCTURES DATA TABLE

SIGN #	STATION	DIMENSIONS			PNLS	MEMBER SIZES						SPLICE		
		A	B	C	D	E	F (CHORD)	G (WEB)	H (LEFT UPRIGHT)	J (RIGHT UPRIGHT)	K (CAMBER)	SA	SB	SC
		ft	ft	ft	#	in	O. D. x Wall Thk. (in)	Angle (in)	HL x HW x Thk. (in)	O. D. x Thk. (in)	in	Angle (in)	#	in
OHS-1-2	267+00.083	138.2500	23.1800	27.0300	13	108	8.63 x 0.500	6 x 6 x 1	2-HSS 16 x 16 x 0.500	36.00 x 0.625	3-3/4	8 x 8 x 1/2	8	1-1/4
OHS-1	28+26.000	94.2600	23.7900	28.1500	11	84	6.63 x 0.432	5 x 5 x 1/2	2-HSS 16 x 16 x 0.625	24.00 x 0.750	1-1/4	6 x 6 x 1/2	6	1-1/4
OHS-2	36+10.000	88.2400	23.6000	28.2000	11	84	6.63 x 0.432	4 x 4 x 1/2	2-HSS 12 x 12 x 0.625	24.00 x 0.750	1-1/4	6 x 6 x 1/2	6	1-1/4
OHS-3	6571+33.000	82.0000	28.1500	27.0400	10	84	5.56 x 0.375	4 x 4 x 1/2	2-HSS 16 x 16 x 0.625	24.00 x 0.750	3/4	5 x 5 x 1/2	6	7/8
OHS-5	46+15.500	95.0500	28.1500	20.8400	10	84	6.63 x 0.432	4 x 4 x 1/2	2-HSS 12 x 12 x 0.625	24.00 x 0.750	1-1/2	6 x 6 x 1/2	8	1-1/4

DUAL POST UPRIGHT SPAN SIGN STRUCTURES DATA TABLE (CONT.)

SIGN #	ALTERNATE SPLICE						GUSSET PLATE																			
	PA	PB	PC	PD	PE	PF	GA	GB	GC		GD		GE		GF		GG		GH		GJ		GK		GL
	in	in	in	in	in	#	in	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	ft	in	in
OHS-1-2	2	3-1/4	7/16	1/2	1-1/2	11	1-1/16	1-1/4	1	10-1/4	0	11-1/4	1	9-1/2	0	9-1/2	2	11-1/4	2	1-3/4	1	2	1	4-1/2	1/4
OHS-1	1-1/2	2	3/8	7/16	1	12	3/4	1	1	6-1/2	0	9-1/4	1	6-1/4	0	8	2	5-3/4	2	0	0	11-3/4	1	4-1/4	3/16
OHS-2	1-1/2	2	3/8	7/16	1	12	1/2	1	1	4-3/4	0	8-3/4	1	4-1/4	0	7-1/2	2	2-1/2	1	10-3/4	0	10-1/4	1	2-1/2	3/16
OHS-3	1-3/8	2	5/16	3/8	1	9	1/2	7/8	1	3-1/4	0	7-3/4	1	2-3/4	0	6-3/4	2	0	1	8-3/4	0	9-3/4	1	1/4	3/16
OHS-5	1-1/2	2	3/8	7/16	1	12	1/2	7/8	1	5-1/2	0	8	1	4-3/4	0	6-1/2	2	4	1	8-3/4	0	9	1	0	3/16

DUAL POST UPRIGHT SPAN SIGN STRUCTURES DATA TABLE (CONT.)

SIGN #	LEFT UPRIGHT CONNECTION								RIGHT UPRIGHT CONNECTION							
	LA	LB	LC	LD	LE	LF	LG	LH	RA	RB	RC	RD	RE	RF	RG	RH
	in	#	in	in	in	in	in	in	in	#	in	in	in	in	in	in
OHS-1-2	7/8	6	1/2	3/4	3/16	3/16	3/16	3/16	7/8	6	1/2	1/2	3/16	5/16	3/16	3/16
OHS-1	7/8	6	1/2	5/8	3/16	1/4	3/16	3/16	7/8	6	1/2	1/2	3/16	3/16	3/16	3/16
OHS-2	7/8	6	1/2	5/8	3/16	1/4	3/16	3/16	7/8	6	1/2	1/2	3/16	3/16	3/16	3/16
OHS-3	7/8	6	1/2	5/8	3/16	1/4	3/16	3/16	7/8	6	1/2	1/2	3/16	3/16	3/16	3/16
OHS-5	7/8	6	1/2	5/8	3/16	1/4	3/16	3/16	7/8	6	1/2	1/2	3/16	3/16	3/16	3/16

DUAL POST UPRIGHT SPAN SIGN STRUCTURES DATA TABLE (CONT.)

SIGN #	LEFT BASE CONNECTION										RIGHT BASE CONNECTION									
	BA	BB	BC	BD	BE		BF	BG	BH	BJ	CA	CB	CC	CD	CE		CF	CG	CH	CJ
	in	#	in	in	ft	in	in	in	in	in	in	#	in	in	ft	in	in	in	in	in
OHS-1-2	1	16	1-1/2	1/2	1	0	5/16	5/16	7/16	1/4	2-1/2	12	1-1/2	1/2	2	9-3/4	5/16	5/16	3/8	3/16
OHS-1	1-1/2	16	1-3/4	1/2	1	6-3/4	5/16	5/16	5/16	5/16	2	16	1-3/4	1/2	2	2-1/4	5/16	5/16	5/16	3/16
OHS-2	2-1/2	12	1-3/4	1/2	2	9-1/2	5/16	5/16	5/16	5/16	2	16	1-3/4	1/2	2	2-1/4	5/16	5/16	5/16	3/16
OHS-3	1-3/4	8	1-3/4	1/2	1	10-1/2	5/16	5/16	5/16	5/16	1-3/4	14	1-3/4	1/2	1	10-1/2	5/16	5/16	5/16	3/16
OHS-5	2-1/2	12	1-3/4	1/2	2	9-1/2	5/16	5/16	5/16	5/16	2	14	1-3/4	1/2	2	2-1/4	5/16	5/16	5/16	3/16

DUAL POST UPRIGHT SPAN SIGN STRUCTURES DATA TABLE (CONT.)

SIGN #	LEFT DRILLED SHAFT								RIGHT DRILLED SHAFT							
	DA		DB		DC	DD	DE	DF	FA		FB		FC	FD	FE	FF
	ft	in	ft	in	# / size	#	in	in	ft	in	ft	in	# / size	#	in	in
OHS-1-2	28	0	5	0	19 / 11	4	9	41	26	0	5	3	20 / 11	4	9	55
OHS-1	26	0	4	6	15 / 11	30	6	30	25	0	4	6	15 / 11	30	6	58
OHS-2	28	0	4	6	15 / 11	30	6	50	25	0	4	6	15 / 11	30	6	58
OHS-3	26	0	5	0	19 / 11	30	6	35	21	0	5	0	19 / 11	30	6	39
OHS-5	24	0	4	6	15 / 11	30	6	50	24	6	4	6	15 / 11	30	6	52

NOTES:

1. Design Wind Speed = 170 mph
2. Upright wall thickness given is a minimum dimension.
3. Erection is the Contractor's responsibility. To facilitate erection, the Contractor should consider using two vertical lift points, each located near a panel point approximately 20 to 25% of the truss length from each end.
4. 'DC' and 'FC' shall include quantity and size of reinforcing steel.

FOUNDATION NOTES:

1. Design based on Borings taken sealed by __________.
2. For soil information, see 'Design Soil/Rock Parameters' table:

DESIGN SOIL/ROCK PARAMETERS

	SOIL PROPERTIES		
SIGN #	UPRIGHT	ϕ DEGREES	ϒ (EFFECTIVE) PCF
OHS - 1 - 2	LEFT	34	55
	RIGHT	32	51
OHS - 1	LEFT	33	52
	RIGHT	32	51
OHS - 2	LEFT	31	49
	RIGHT	32	50
OHS - 3	LEFT	31	49
	RIGHT	32	50
OHS - 5	LEFT	32	53
	RIGHT	32	53

REVISIONS

DATE	BY	DESCRIPTION	DATE	BY	DESCRIPTION

DRAWN BY:
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DESIGNED BY:
CHECKED BY:

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
DATA TABLE (1 OF 2)

PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

REF. DWG. NO.

SHEET NO.
S-X

RD647DC 10/16/2019 9:22:28 AM C:\Projects\42835855201\struct\SignStructSpan12.dgn

DUAL POST UPRIGHT DETAILS

SIGN #	STATION	DUAL POST DIMENSIONS						BRACES	DUAL POST UPRIGHT GUSSET PLATES									
		Y	B	E	N	X	Z	L	GM	GN	GO	GP	GQ	GR	GS	GT	GU	GV
		in	ft	in	# (PNLS)	ft	in	Angle (in)	in	in	in	in	in	in	in	in	in	in
OHS-1-2	267+00.083	108	23.18	108	2	4.84	96	Angle 6 x 6 x 1	1.0625	1.25	12	32	12.75	32	12.75	42.75	9	0.3125
OHS-1	28+26	108	23.79	84	3	3.76	96	Angle 6 x 6 x 1	0.75	0.875	11.5	20.75	11.5	21.75	12	30.75	6.25	0.5
OHS-2	36+10	108	23.6	84	3	3.7	96	Angle 6 x 6 x 1	0.625	1	15	20	15	21.75	15.5	28.75	7.25	0.4375
OHS-3	6571+33	108	28.15	84	3	5.22	96	Angle 6 x 6 x 1	0.625	0.875	9.25	20.75	9.25	27.25	9.25	32.25	6.25	0.4375
OHS-5	46+15.5	108	28.15	84	3	5.22	96	Angle 6 x 6 x 1	0.625	1	10.5	20	10.5	26.5	11	30.75	7.25	0.4375

DUAL POST UPRIGHT DETAILS (CONT.)

SIGN #	DUAL BASE CONNECTION			
	BK	BM	BN	BP
	in	in	in	in
OHS-1-2	48	6.125	4.9375	3.5
OHS-1	48	6.125	4.9375	3.5
OHS-2	48	8.75	4.625	4.375
OHS-3	48	6.125	4.9375	3.625
OHS-5	48	8.75	4.625	4.375

DUAL POST UPRIGHT DETAILS (CONT.)

SIGN #	UPRIGHT	BARRIER WALL COLUMN			
		ELEVATIONS		REINFORCEMENT	
		A1	B1	PR	PV (in)
OHS-1-2	LEFT	19.000	14.333	28	6
OHS-1	LEFT	19.000	14.333	28	6
OHS-2	LEFT	19.000	14.333	28	6
OHS-3	LEFT	19.000	14.333	28	6
OHS-5	LEFT	19.000	14.333	28	6

ESTIMATED QUANTITIES

SIGN #	UPRIGHT	ITEM	UNIT	QUANTITY
OHS-1-2	LEFT	Class IV Concrete (Barrier Wall)	CY	5.19
		Reinforcing Steel	LB	3752
OHS-1	LEFT	Class IV Concrete (Barrier Wall)	CY	5.19
		Reinforcing Steel	LB	3752
OHS-2	LEFT	Class IV Concrete (Barrier Wall)	CY	5.19
		Reinforcing Steel	LB	3752
OHS-3	LEFT	Class IV Concrete (Barrier Wall)	CY	5.19
		Reinforcing Steel	LB	3752
OHS-5	LEFT	Class IV Concrete (Barrier Wall)	CY	5.19
		Reinforcing Steel	LB	3752

NOTES:

1. Design Wind Speed = 170 mph
2. Upright wall thickness given is a minimum dimension.
3. Erection is the Contractor's responsibility. To facilitate erection, the Contractor should consider using two vertical lift points, each located near a panel point approximately 20 to 25% of the truss length from each end.

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ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

SHEET TITLE:
DUAL POST UPRIGHT SPAN SIGN STRUCTURE
DATA TABLE (2 OF 2)

PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

REF. DWG. NO.

SHEET NO.
S-X

SUMMARY OF REINFORCEMENT FOR CONCRETE BARRIER WALLS

SIGN #	COMPONENT	MARK		LENGTH		NO.	TYPE	STYLE		B		C		D	
		SIZE	DES	ft	in	BARS		A	G	ft	in	ft	in	ft	in
OHS-1-2	BARRIER WALL	6	B02	5	10	40	4	4	4	2	2	1	8	-	-
		6	B03	16	1	20	11	-	-	11	6	1	8	1	8
		10	B01	4	2	56	1	-	-	4	2	-	-	-	-
		10	B04	28	8	8	11	-	-	1	9	13	5	13	5
		10	B05	13	5	16	1	-	-	13	5	-	-	-	-
OHS-1	BARRIER WALL	6	B02	5	10	40	4	4	4	2	2	1	8	-	-
		6	B03	16	1	20	11	-	-	11	6	1	8	1	8
		10	B01	4	2	56	1	-	-	4	2	-	-	-	-
		10	B04	28	8	8	11	-	-	1	9	13	5	13	5
		10	B05	13	5	16	1	-	-	13	5	-	-	-	-
OHS-2	BARRIER WALL	6	B02	5	10	40	4	4	4	2	2	1	8	-	-
		6	B03	16	1	20	11	-	-	11	6	1	8	1	8
		10	B01	4	2	56	1	-	-	4	2	-	-	-	-
		10	B04	28	8	8	11	-	-	1	9	13	5	13	5
		10	B05	13	5	16	1	-	-	13	5	-	-	-	-
OHS-3	BARRIER WALL	6	B02	5	10	40	4	4	4	2	2	1	8	-	-
		6	B03	16	1	20	11	-	-	11	6	1	8	1	8
		10	B01	4	2	56	1	-	-	4	2	-	-	-	-
		10	B04	28	8	8	11	-	-	1	9	13	5	13	5
		10	B05	13	5	16	1	-	-	13	5	-	-	-	-
OHS-5	BARRIER WALL	6	B02	5	10	40	4	4	4	2	2	1	8	-	-
		6	B03	16	1	20	11	-	-	11	6	1	8	1	8
		10	B01	4	2	56	1	-	-	4	2	-	-	-	-
		10	B04	28	8	8	11	-	-	1	9	13	5	13	5
		10	B05	13	5	16	1	-	-	13	5	-	-	-	-

NOTES:

1. See Index 415-001 for Bar Bending details (steel).
2. The number of bars shown for the barrier wall reinforcement accounts for the total number of bars needed in the dual uprigth assembly.
3. See Index 521-001 for Median Barrier Wall and Transition details.

NOT FOR CONSTRUCTION PRELIMINARY AND SUBJECT TO CHANGE

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ROAD NO.	COUNTY	FINANCIAL PROJECT ID
SR 9A	MIAMI-DADE	428358-5-52-01

SHEET TITLE:
REINFORCING BAR LIST
FOR CONCRETE BARRIER WALLS

PROJECT NAME:
GOLDEN GLADES INTERCHANGE
SR 9A/I-95 N. OF BISCAYNE RIVER CANAL

REF. DWG. NO.

SHEET NO.
S-X