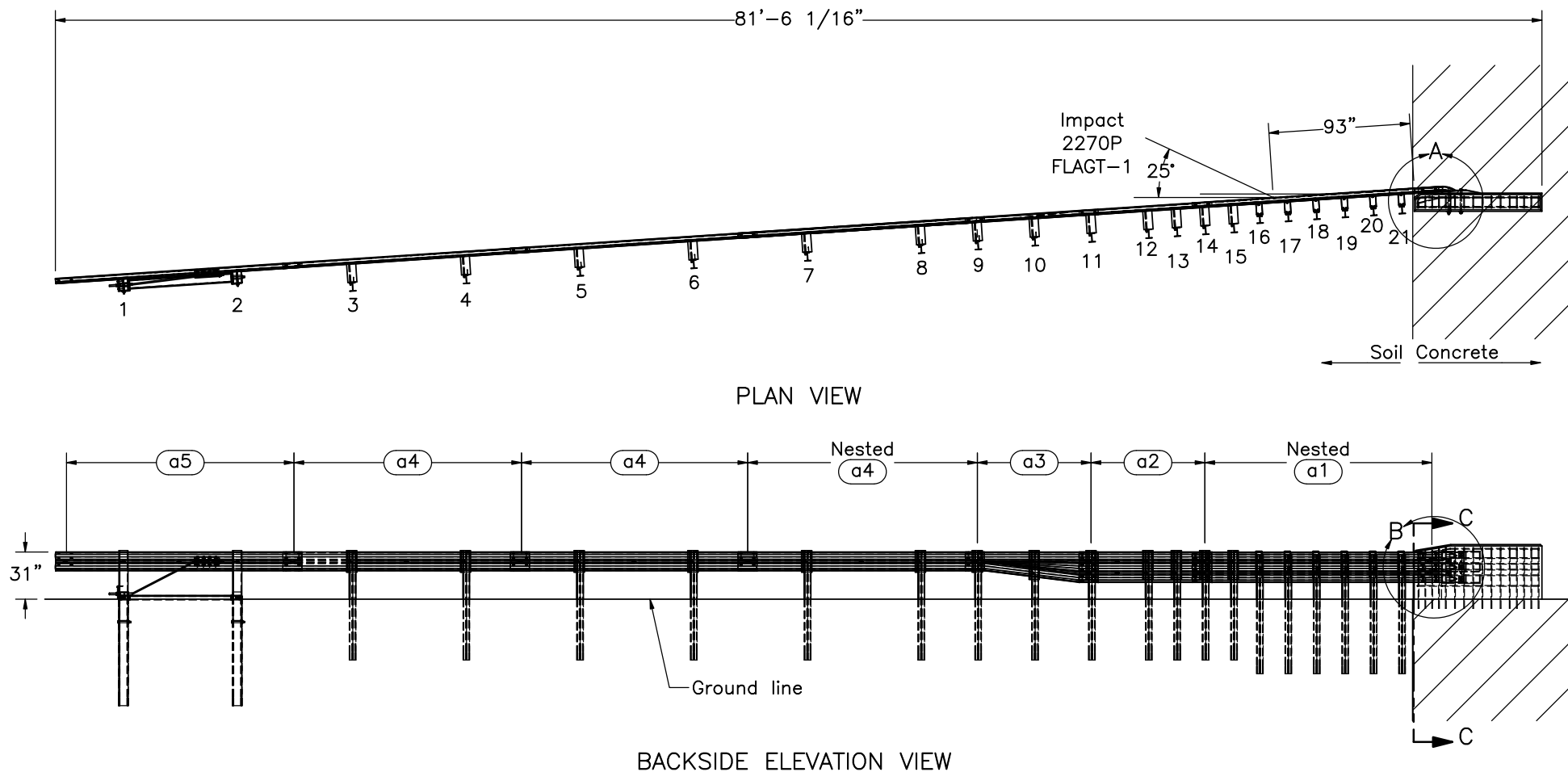




- Notes: (1) Test no. 1 shall be performed according to test designation no. 3-21 using MASH 2016 criteria.
- (2) Critical region for test no. 1 is located between post nos. 12 and 21.
- (3) The impact location for test no. 1 is 93" from the upstream end of the buttress.
- (4) BCT anchors are placed in 3'Ø holes, then backfilled and tamped with soil.
- (5) Quantities listed herein are only for 1 system installation.



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

System Layout

DWG. NAME.
FLAGT-1_R9

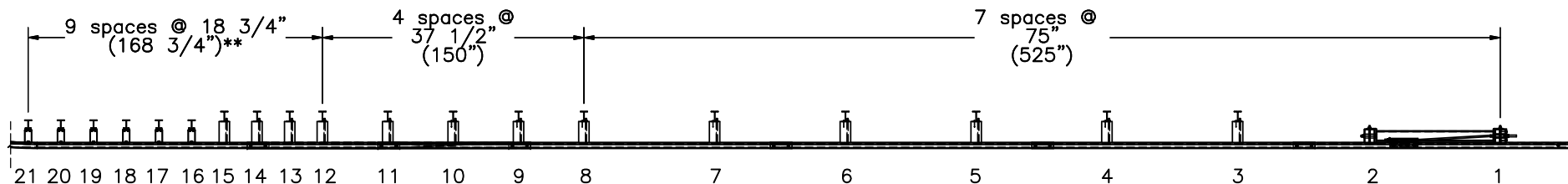
SCALE: 1:102
UNITS: in.

SHEET:
1 of 27

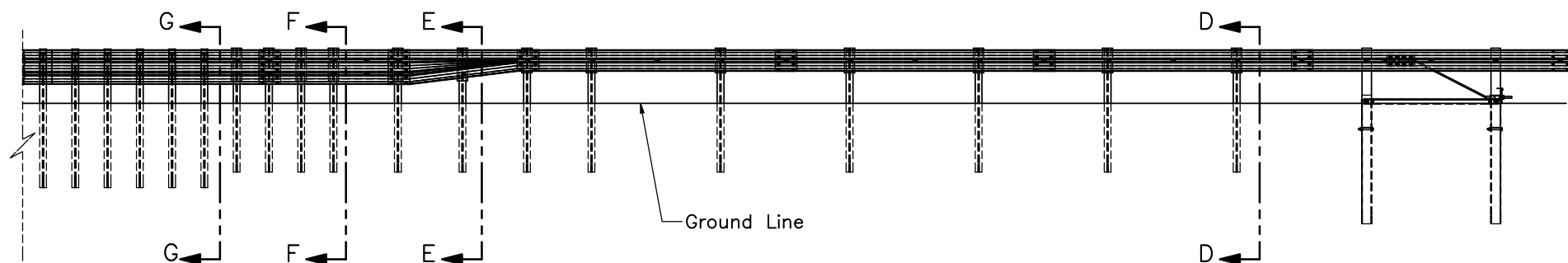
DATE:
3/19/2021

DRAWN BY:
LJP/JRF/SB
W/GHR

REV. BY:
RFB/KAL



PLAN VIEW*

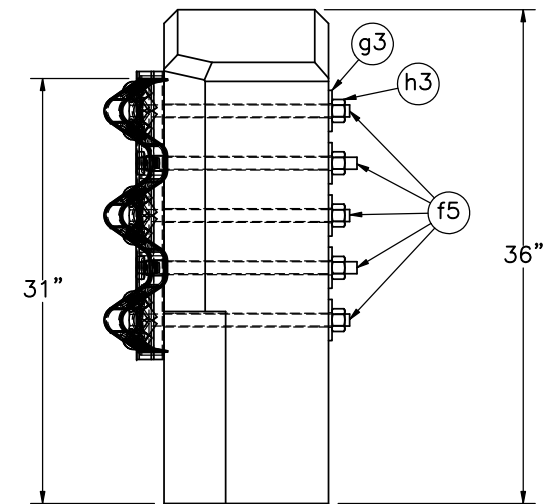
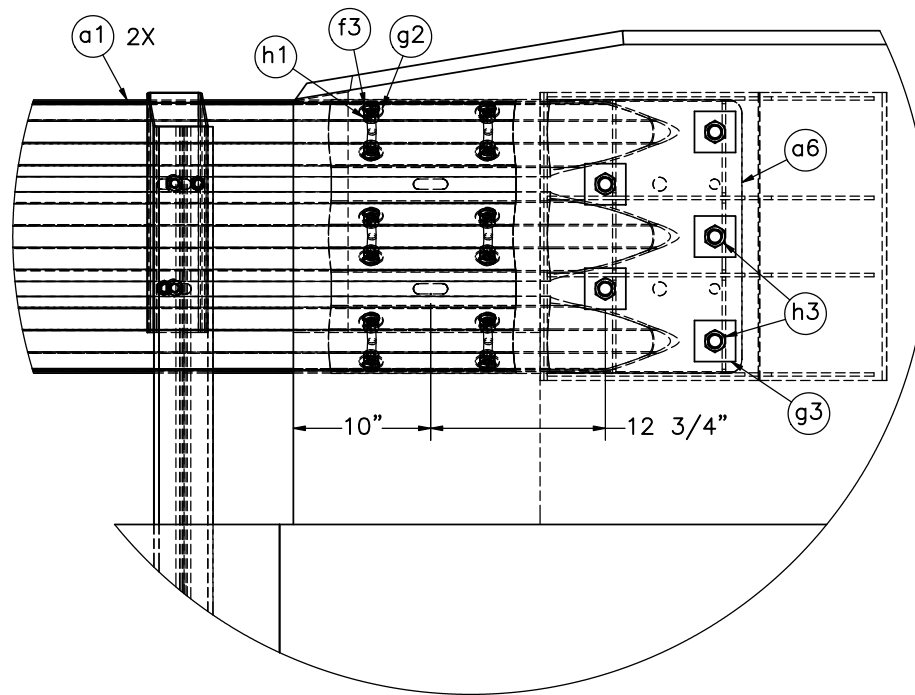
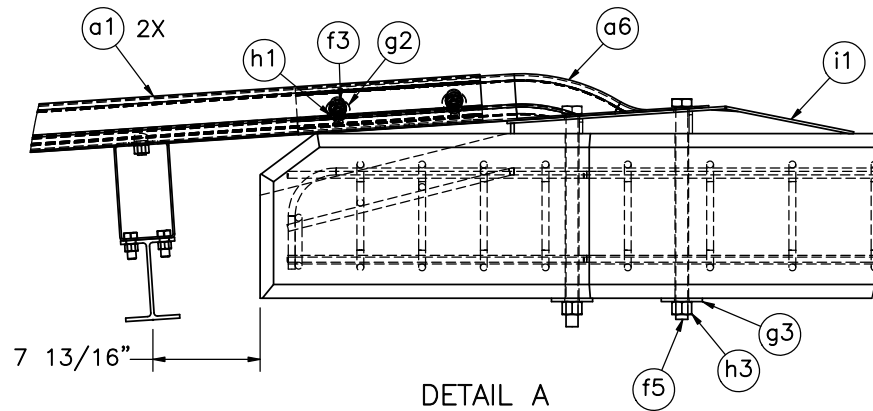


ELEVATION VIEW*

*These views are elevation views normal to the front face of the rail upstream from the terminal connector.

**Distance between posts 15 & 16 may be slightly shorter than the nominal 18 3/4" due to the guardrail bolt's position relative to the post shifting (different blockouts).

	Flared AGT Buttress Test No. FLAGT-1		SHEET: 2 of 27
	System Details		DATE: 3/19/2021
Midwest Roadside Safety Facility	DWG. NAME: FLAGT-1_R9		DRAWN BY: LJF/JRF/SB W/GHR
	SCALE: 1:92 UNITS: in.		REV. BY: RFB/KAL



- Notes: (1) Buttress reinforcement hidden for clarity in details B and C.
 (2) Nested thrie beam sections sandwich thrie beam terminal connector at splice location.
 (3) Washers (part g2) placed between nuts and inner thrie beam section.
 (4) Guardrail bolts (part f4) may be used in place of guardrail bolts (part f3) in nested thrie beam splices if the nut can be fully threaded (dependent on thickness of stacked guardrail layers).



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Thrie Beam End Connector and
Buttress Details

DWG. NAME:
FLAGT-1_R9

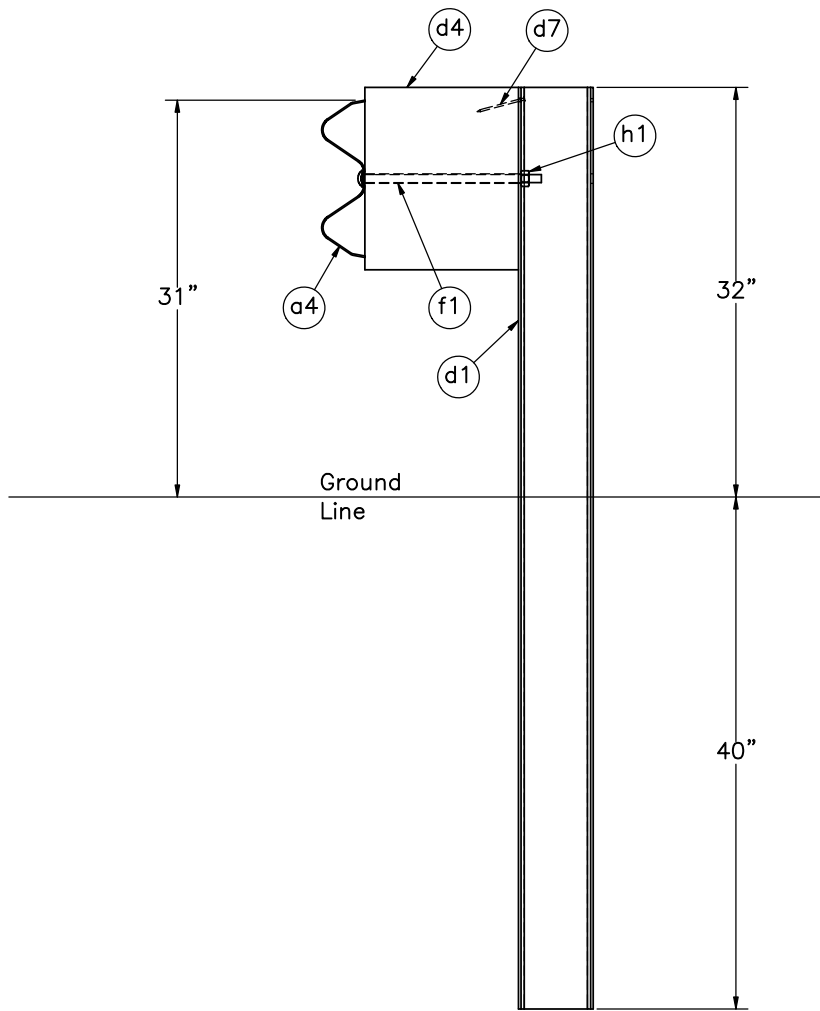
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SHEET:
3 of 27

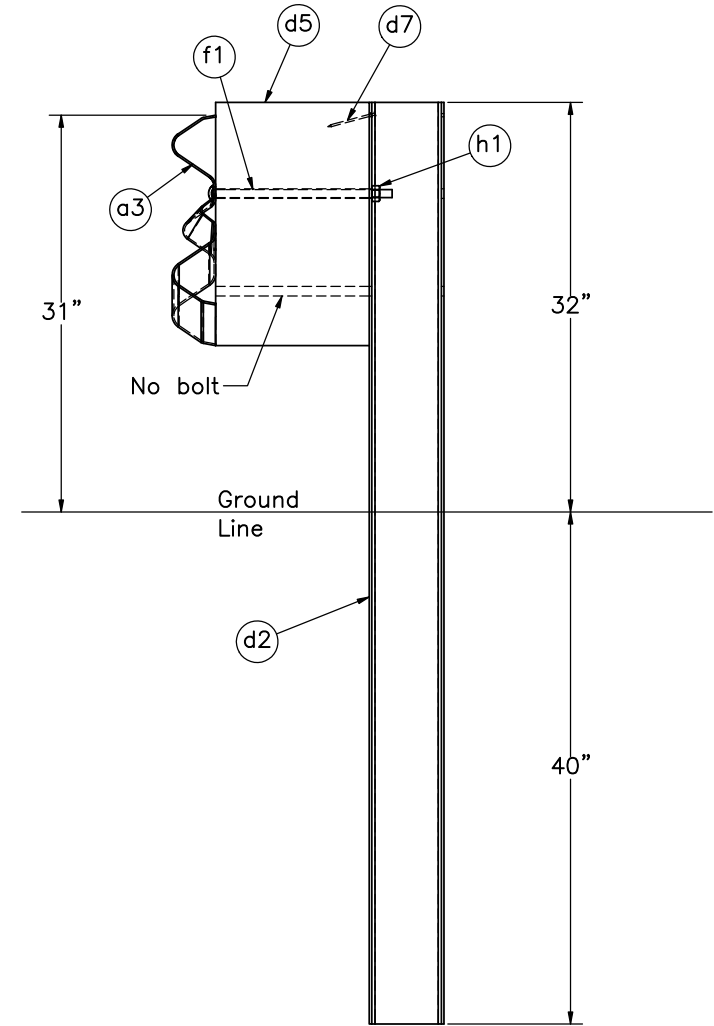
DATE:
3/19/2021

DRAWN BY:
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W/GHR

REV. BY:
RFB/KAL



SECTION D-D
Post nos. 3-9



SECTION E-E
Post no. 10



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Post nos. 3-10 Details

DWG. NAME.
FLAGT-1_R9

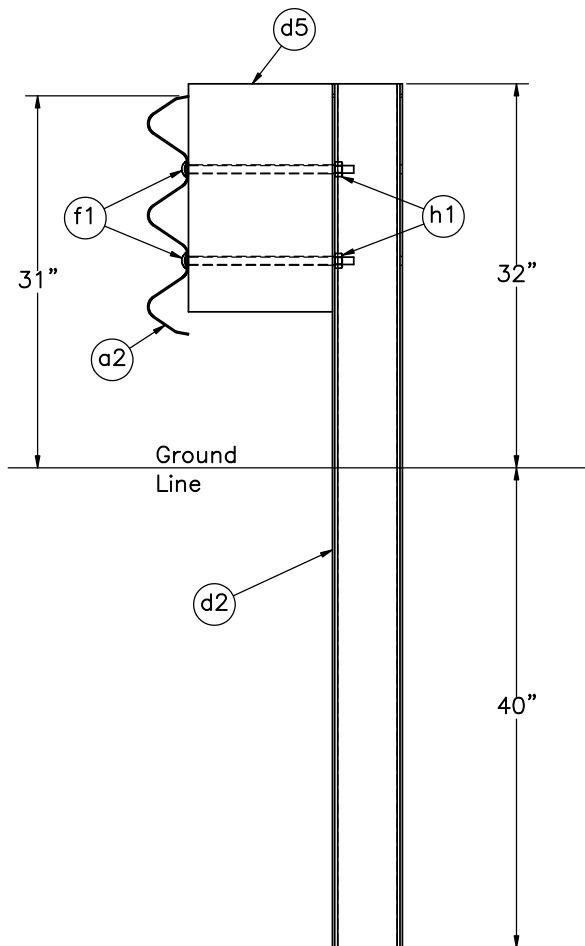
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SHEET:
4 of 27

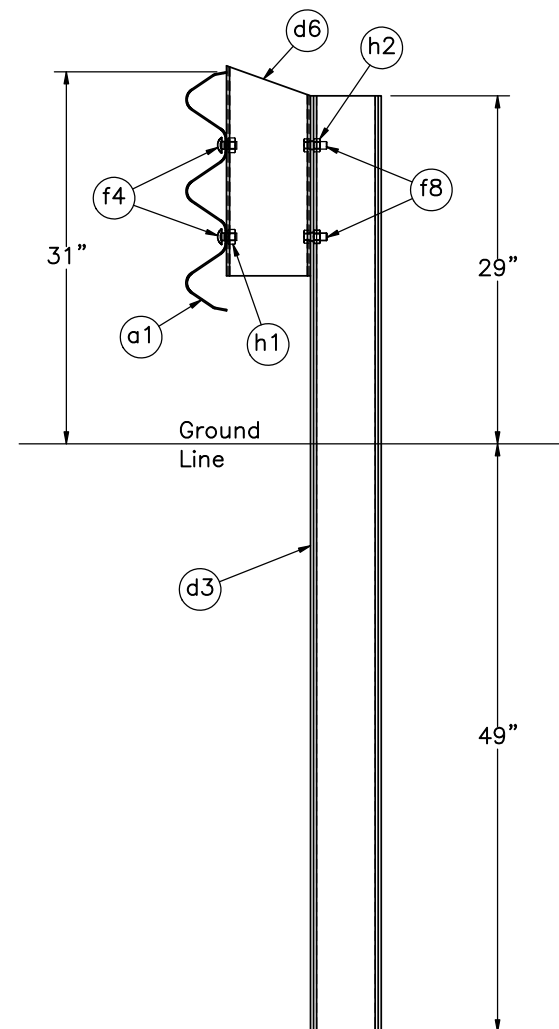
DATE:
3/19/2021

DRAWN BY:
LJF/JRF/SB
W/GHR

REV. BY:
RFB/KAL



SECTION F-F
Post nos. 11-15



SECTION G-G
Post nos. 16-21



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Post nos. 11-21 Details

DWG. NAME.
FLAGT-1_R9

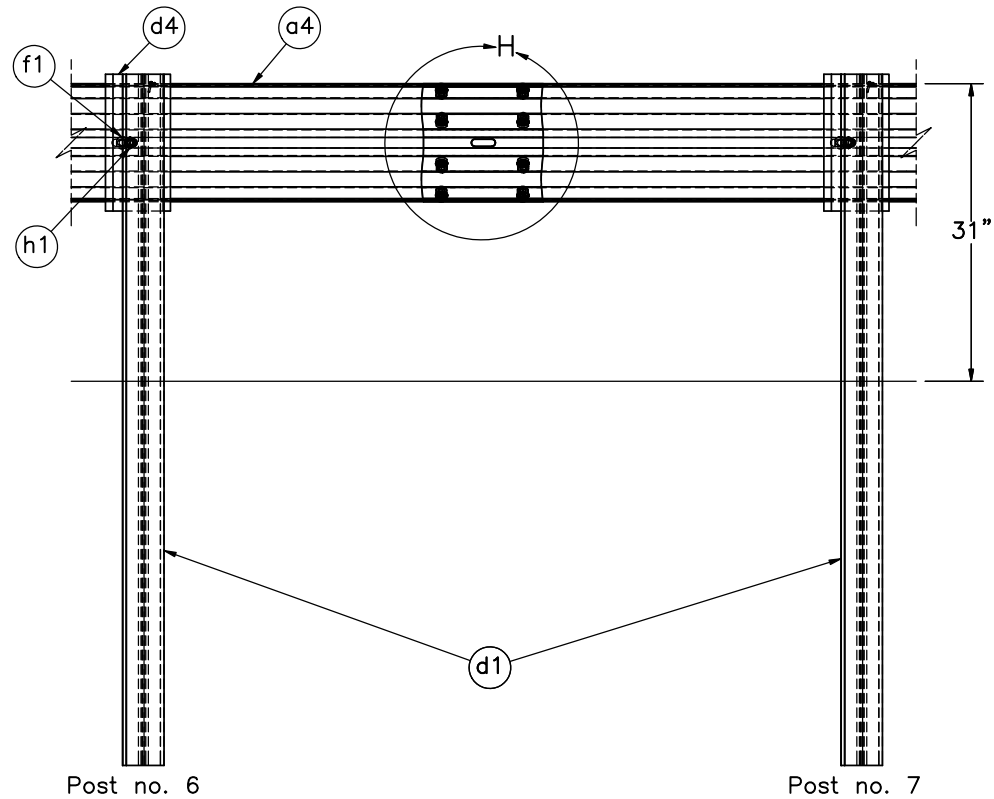
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UNITS: in.

SHEET:
5 of 27

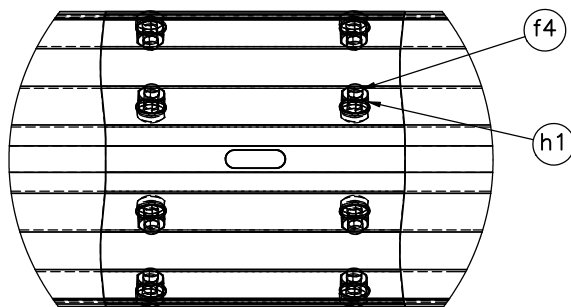
DATE:
3/19/2021

DRAWN BY:
LJP/JRF/SB
W/GHR

REV. BY:
RFB/KAL



SPLICE DETAIL
BACKSIDE



DETAIL H
SCALE 1:8

- Note: (1) Guardrail bolts (part f1) on the upstream side of the web.
 (2) Guardrail bolts (part f4) may be used in place of guardrail bolts (part f3) in nested W-beam splices if the nut can be fully threaded (dependent on thickness of stacked guardrail layers).



Midwest Roadside
Safety Facility

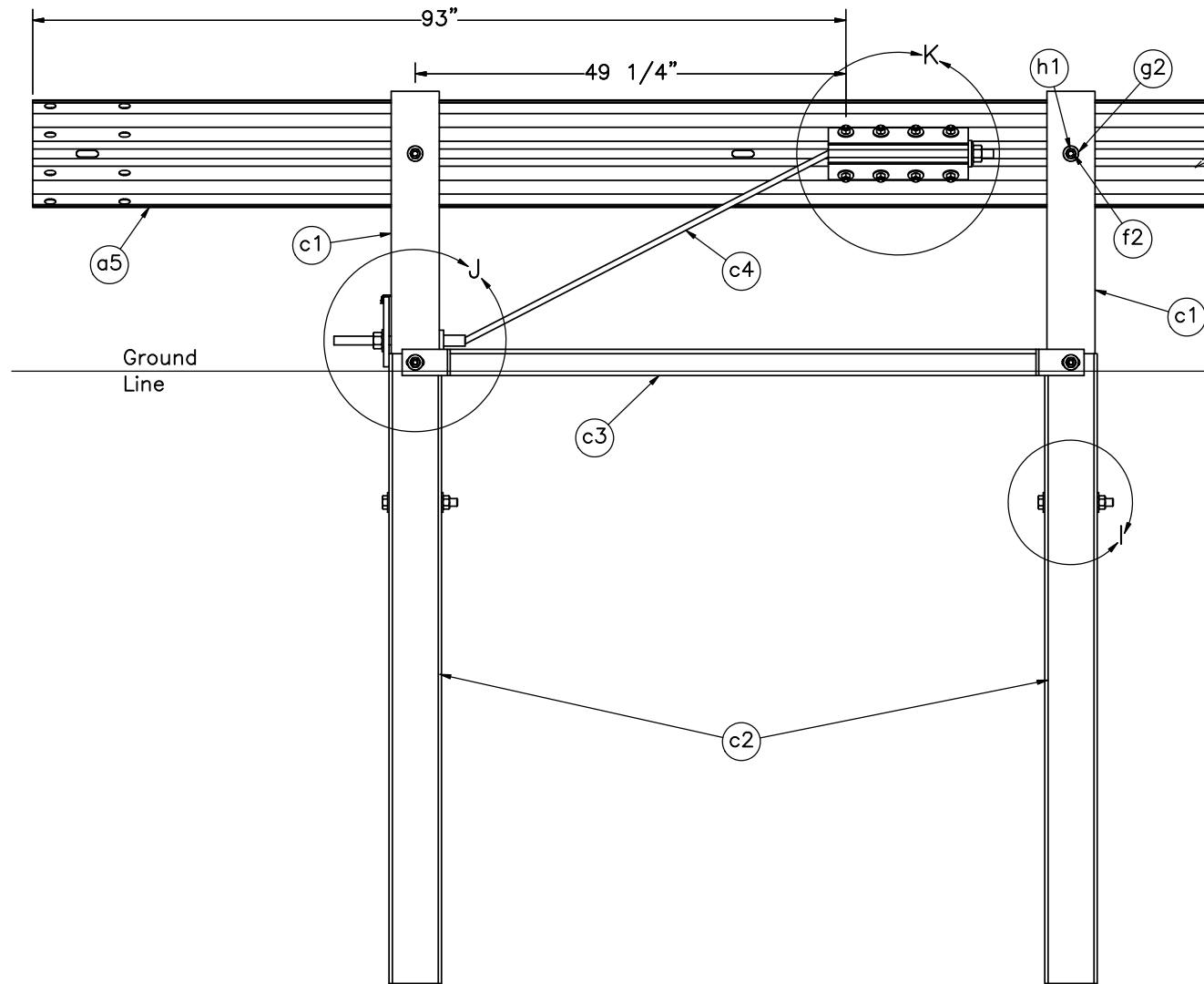
Flared AGT
Buttress
Test No. FLAGT-1

Splice Detail

DWG. NAME.
FLAGT-1_R9

SCALE: 1:20
UNITS: in.

SHEET:
6 of 27
DATE:
3/19/2021
DRAWN BY:
LJF/JRF/SB
W/GHR
REV. BY:
RFB/KAL



Post no. 1

END SECTION DETAIL BACKSIDE

Post no. 2



Midwest Roadside
Safety Facility

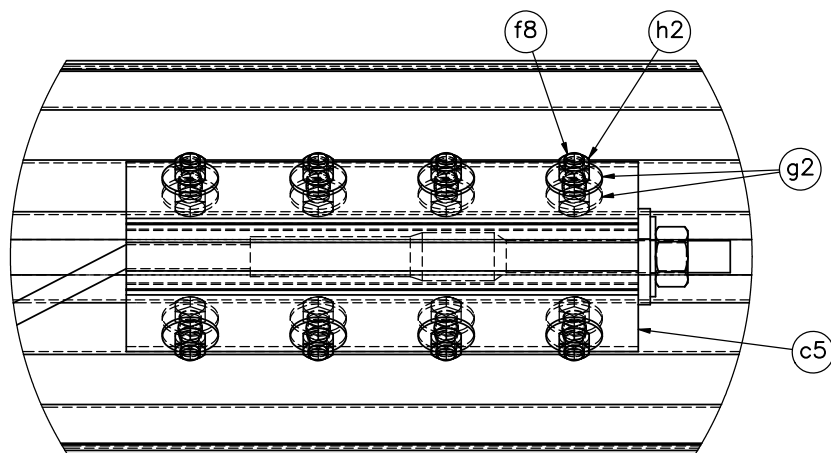
Flared AGT
Buttress
Test No. FLAGT-1

End Section Detail

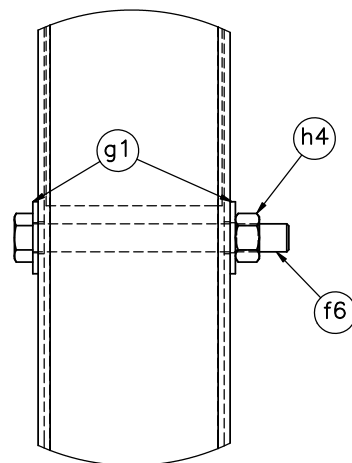
DWG. NAME.
FLAGT-1_R9

SCALE: 1:20
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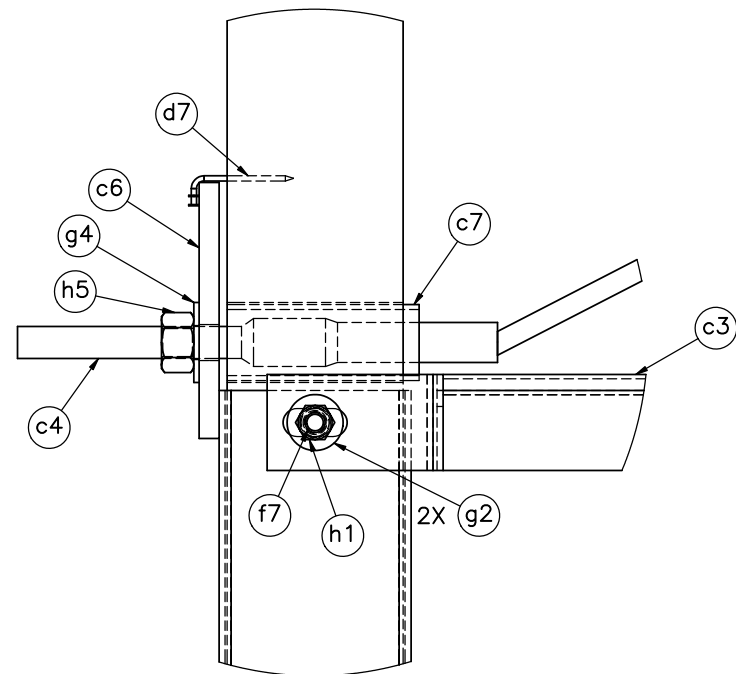
SHEET:
7 of 27
DATE:
3/19/2021
DRAWN BY:
LJP/JRF/SB
W/GHR
REV. BY:
RFB/KAL



DETAIL K



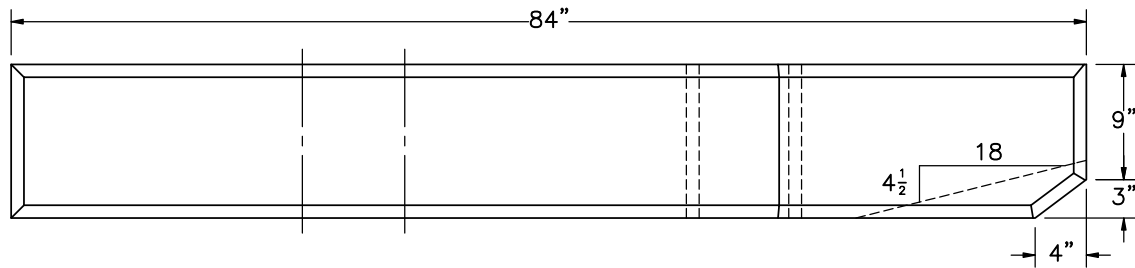
DETAIL I



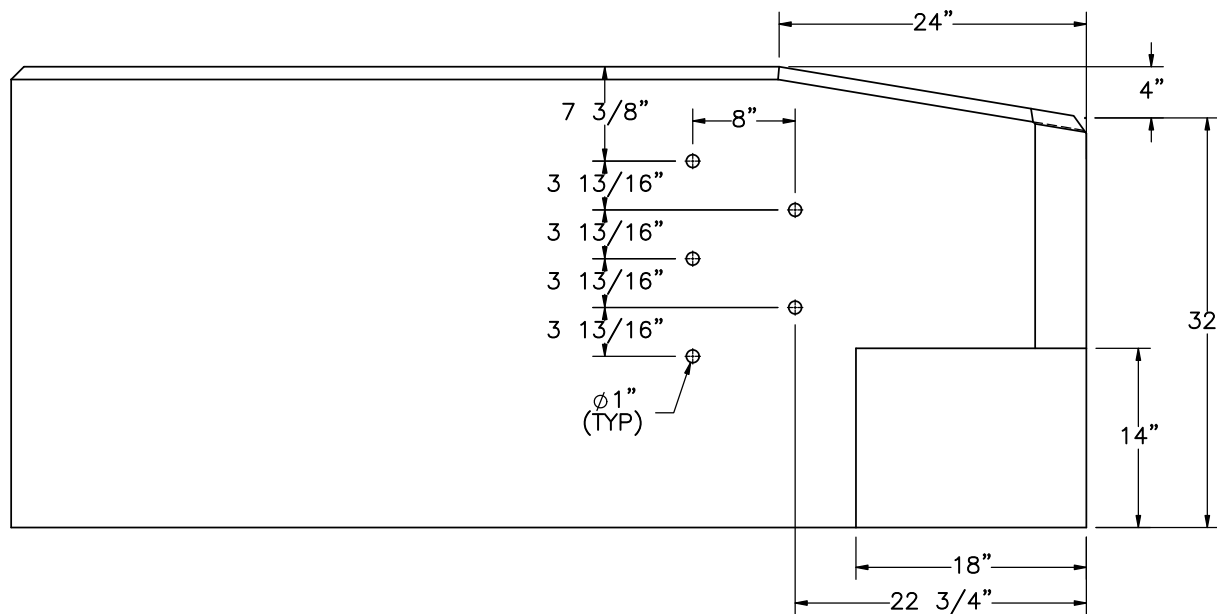
DETAIL J

- Note: (1) Additional washer (part g2) located on opposite side under the bolt (part f7).
 (2) Two nails (part d7) are used to hold the anchor bearing plate (part c6).

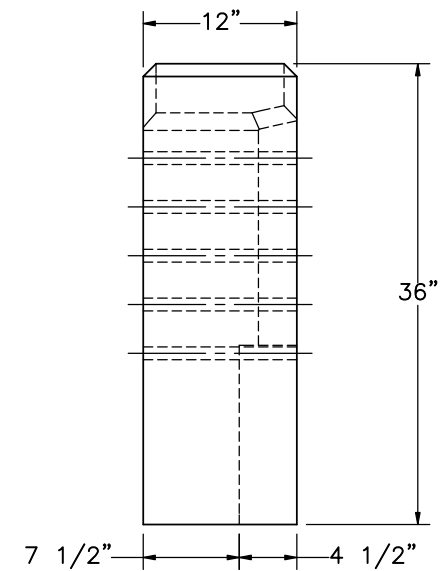
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	BCT Anchor Details		DATE: 3/19/2021
Midwest Roadside Safety Facility	DWG. NAME: FLAGT-1_R9		DRAWN BY: LJP/JRF/SB W/GHR
	SCALE: 1:6 UNITS: in.		REV. BY: RFB/KAL



PLAN VIEW



ELEVATION VIEW
Part b1



PROFILE VIEW

- Notes: (1) Lower setback has lateral flare of 1:4.
 (2) Five 1" diameter holes are required for placement of 7/8" diameter bolts.
 (3) All edges of the top of the buttress are chamfered 1".



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Buttress Details

DWG. NAME.
FLAGT-1_R9

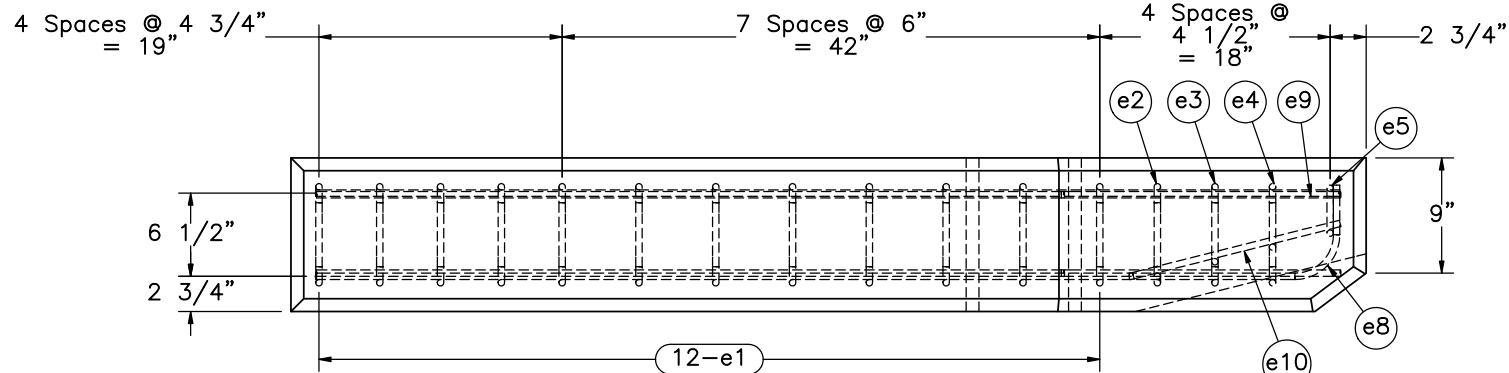
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SHEET:
9 of 27

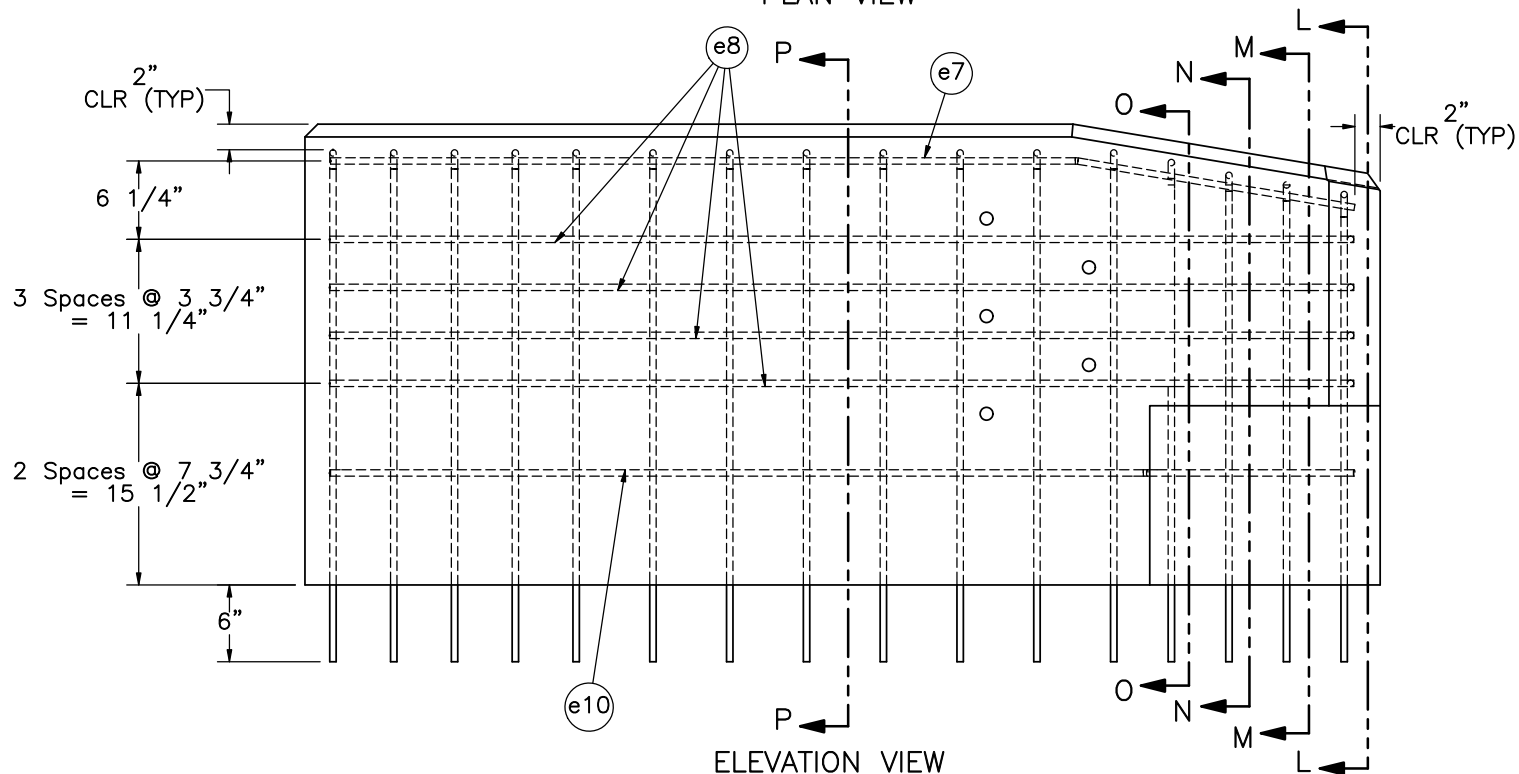
DATE:
3/19/2021

DRAWN BY:
LJP/JRF/SB
W/GHR

REV. BY:
RFB/KAL



PLAN VIEW



ELEVATION VIEW

- Note: (1) Vertical rebar embedded in tarmac with chemical epoxy adhesive with a minimum bond strength of 1,450 psi.
 (2) All edges of the top of the buttress are chamfered 1".



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Rebar Detail

DWG. NAME.
FLAGT-1_R9

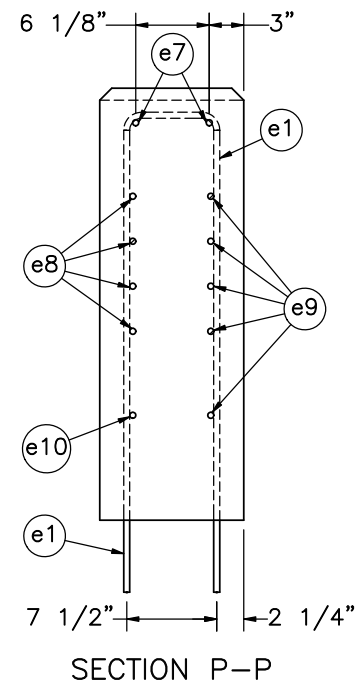
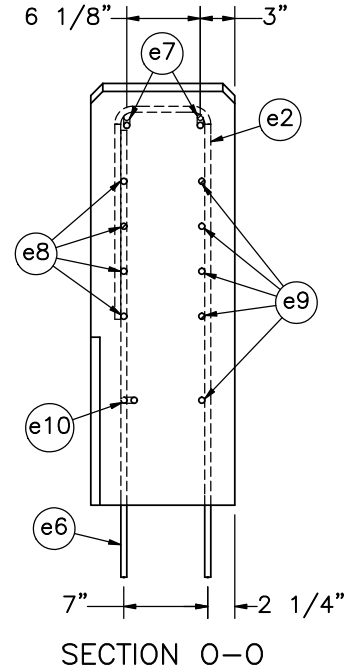
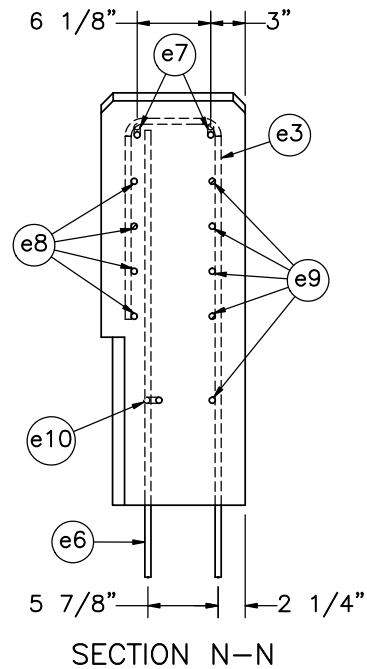
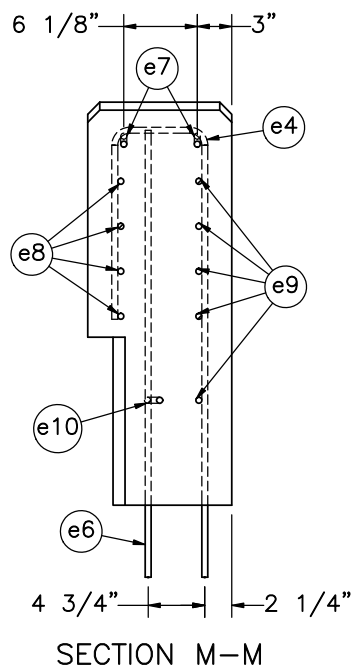
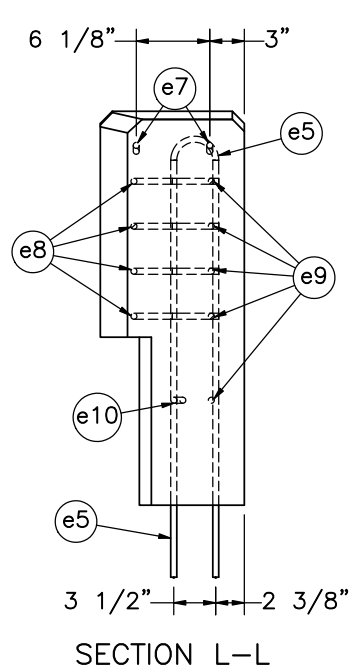
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UNITS: in.

SHEET:
10 of 27

DATE:
3/19/2021

DRAWN BY:
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REV. BY:
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Note: (1) All stirrups have minimum 2" concrete clear cover.



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Rebar Detail Sections

DWG. NAME.
FLAGT-1_R9

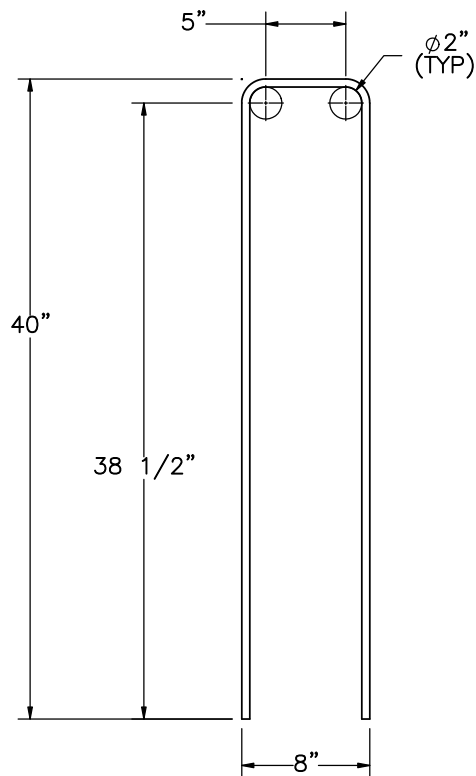
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SHEET:
11 of 27

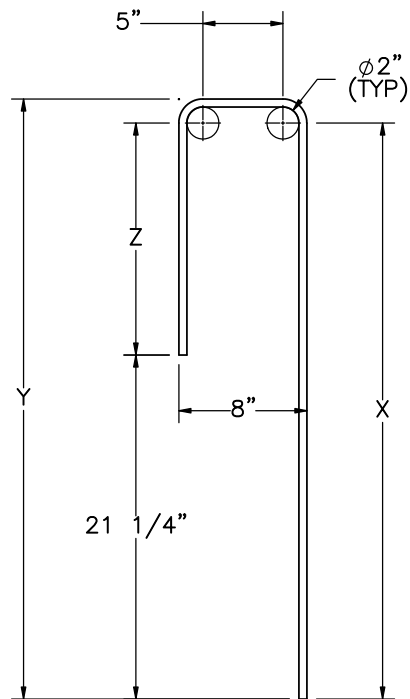
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3/19/2021

DRAWN BY:
LJF/JRF/SB
W/GHR

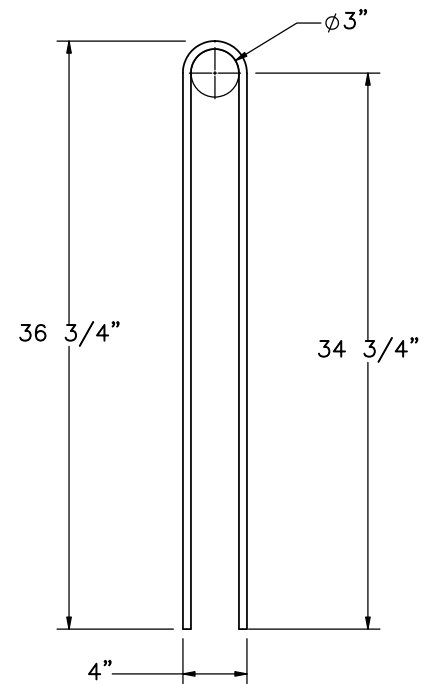
REV. BY:
RFB/KAL



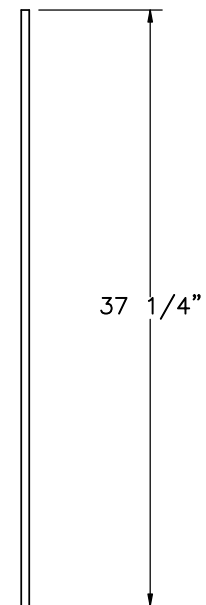
Bar e1



Bars e2, e3, e4



Bar e5



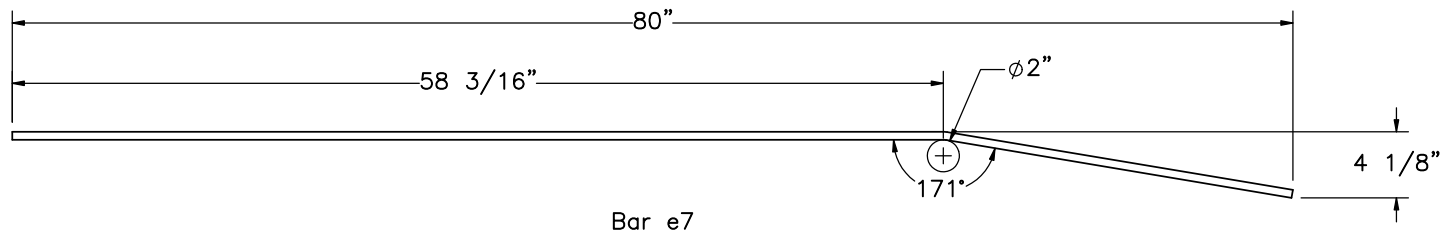
Bar e6

Bill of Bars						
Bar No.	QTY	Size	X	Y	Z	Unbent Length
e1	12	#4	38 1/2"	40"	—	86"
e2	1	#4	37 1/2"	39"	16 1/4"	62 3/4"
e3	1	#4	36 1/2"	38"	15 1/4"	60 1/2"
e4	1	#4	35 3/4"	37 1/4"	14 1/2"	59 1/4"
e5	1	#4	34 3/4"	36 3/4"	—	74 3/4"
e6	3	#4	—	—	—	37 1/4"

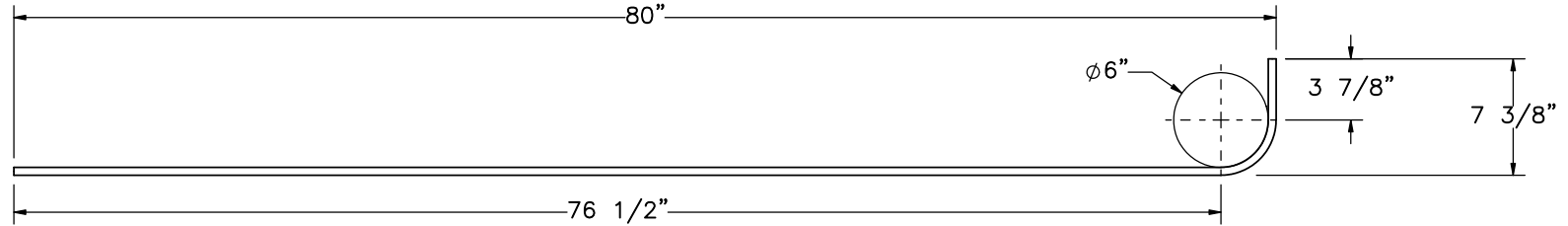


Midwest Roadside
Safety Facility

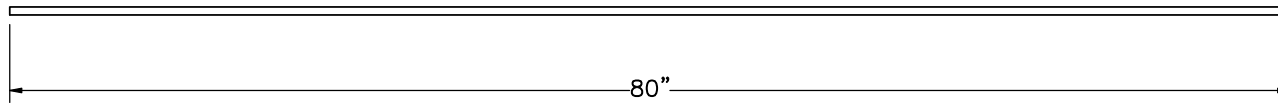
Flared AGT Buttress Test No. FLAGT-1 Vertical Bar Details		SHEET: 12 of 27
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DWG. NAME: FLAGT-1_R9	SCALE: 1:12 UNITS: in.	REV. BY: RFB/KAL



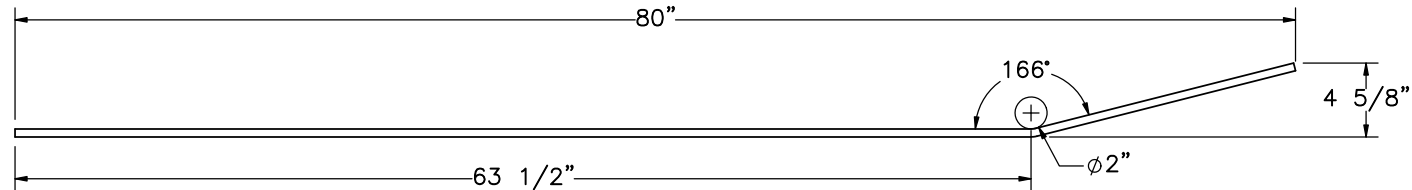
Bar e7



Bar e8



Bar e9



Bar e10

Bill of Bars

Bar No.	Qty.	Size	Unbent Length
e7	2	#4	80 1/4"
e8	4	#4	85 1/2"
e9	5	#4	80"
e10	1	#4	80 1/2"



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Horizontal Rebar Details

DWG. NAME.
FLAGT-1_R9

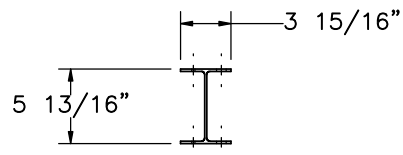
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SHEET:
13 of 27

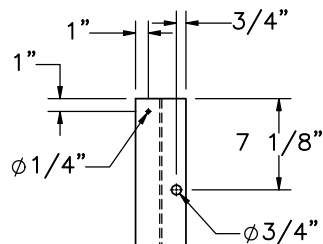
DATE:
3/19/2021

DRAWN BY:
LJF/JRF/SB
W/GHR

REV. BY:
RFB/KAL

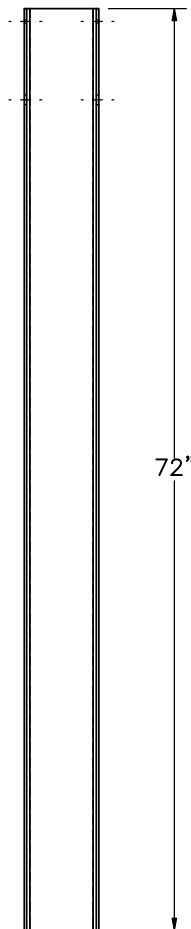


PLAN VIEW

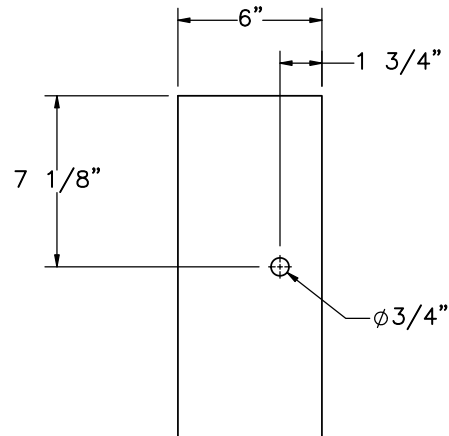


ELEVATION VIEW

Part d1

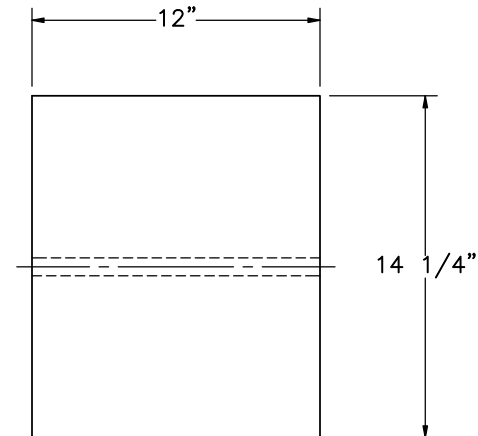


PROFILE VIEW

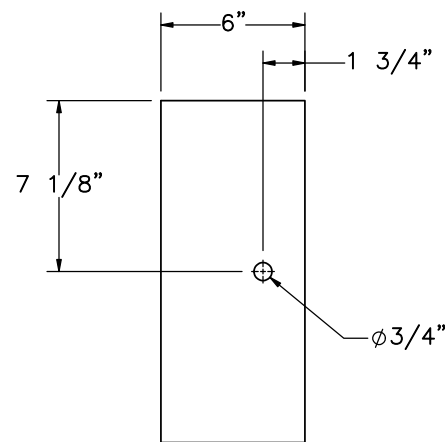


ELEVATION VIEW

Part d4
SCALE 1:8

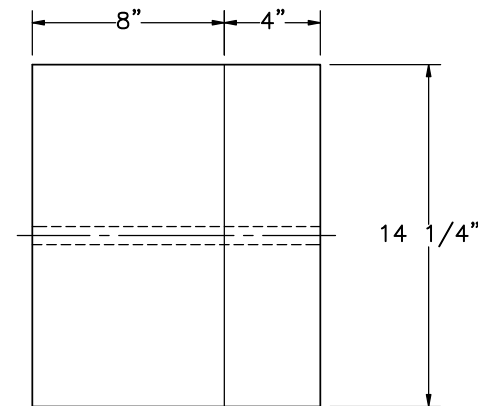


PROFILE VIEW



ELEVATION VIEW

Alternate Blockout Option
6"x4"x14 1/4" Blockout with 6"x8"x14 1/4" Blockout
SCALE 1:8



PROFILE VIEW



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Post Nos. 3-9 Components

DWG. NAME.
FLAGT-1_R9

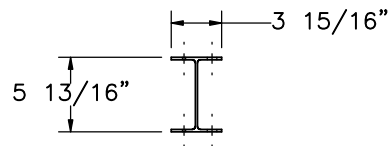
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SHEET:
14 of 27

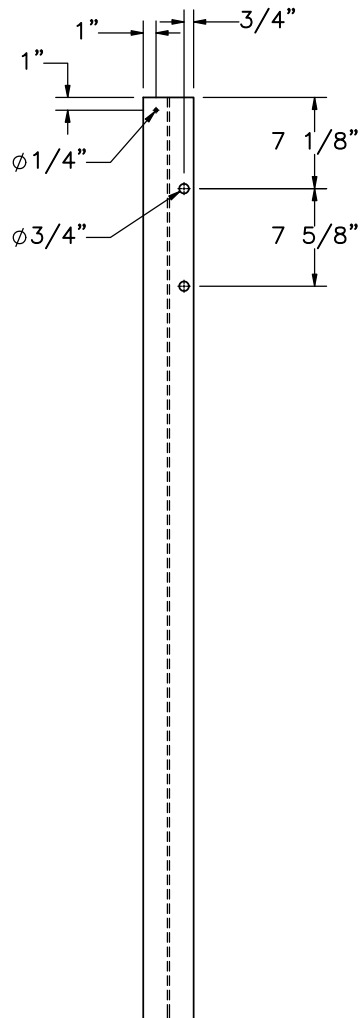
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3/19/2021

DRAWN BY:
LJP/JRF/SB
W/GHR

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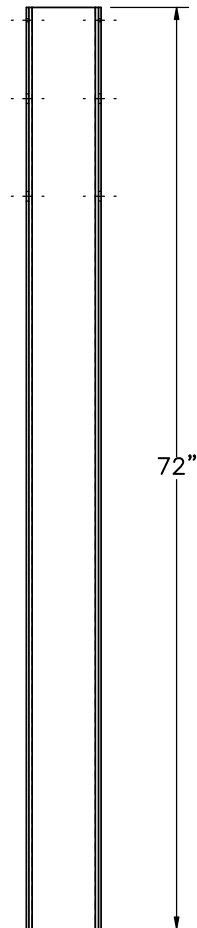


PLAN VIEW

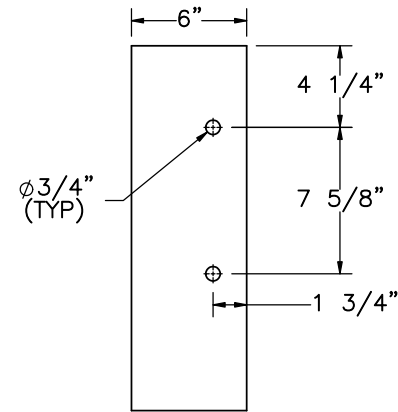


ELEVATION VIEW

Part d2

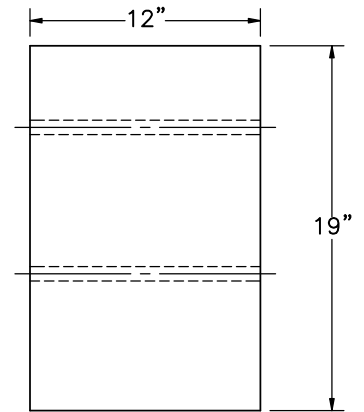


PROFILE VIEW

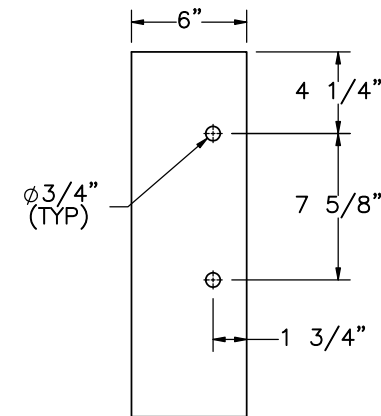


ELEVATION VIEW

Part d5
SCALE 1:10

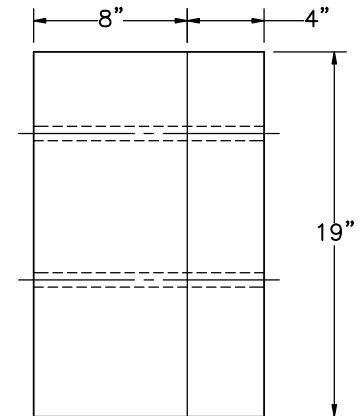


PROFILE VIEW



ELEVATION VIEW

Alternate Blockout Option
6"x4"x19" Blockout with 6"x8"x19" Blockout
SCALE 1:10



PROFILE VIEW



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Post Nos. 10-15 Components

DWG. NAME.
FLAGT-1_R9

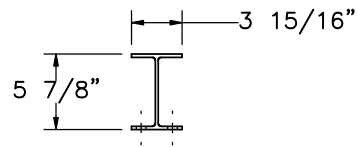
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SHEET:
15 of 27

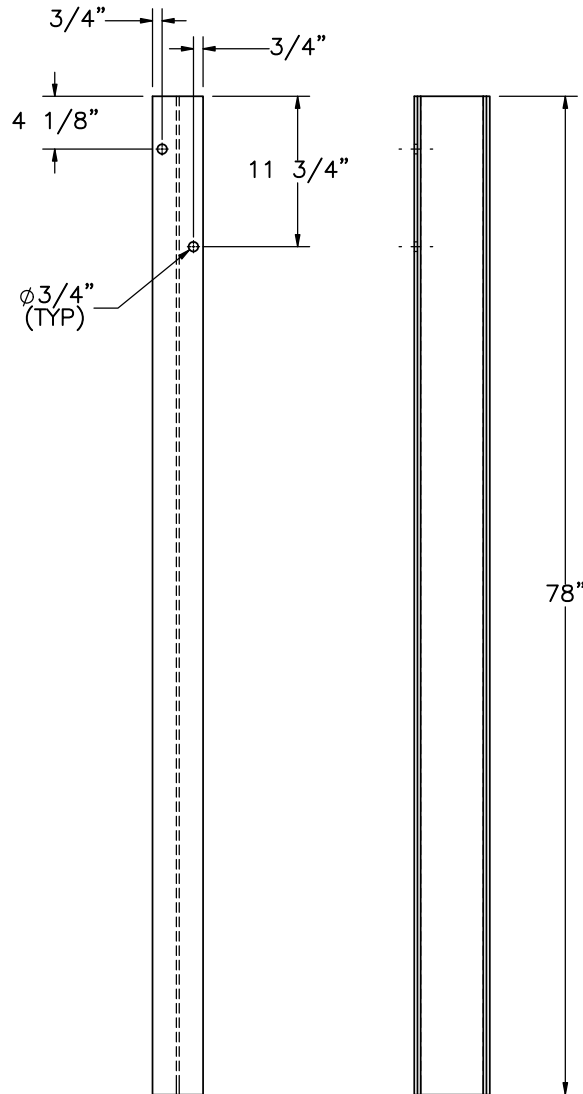
DATE:
3/19/2021

DRAWN BY:
LJF/JRF/SB
W/GHR

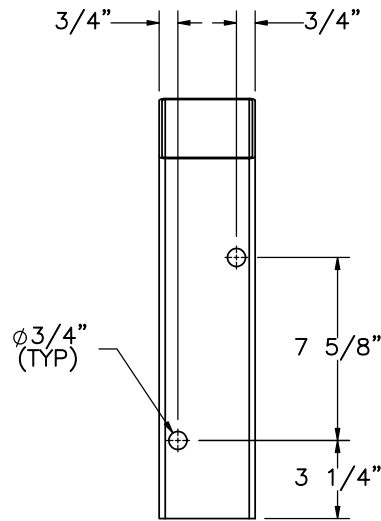
REV. BY:
RFB/KAL



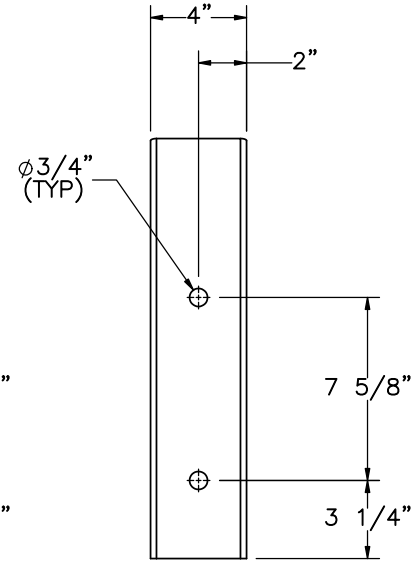
PLAN VIEW



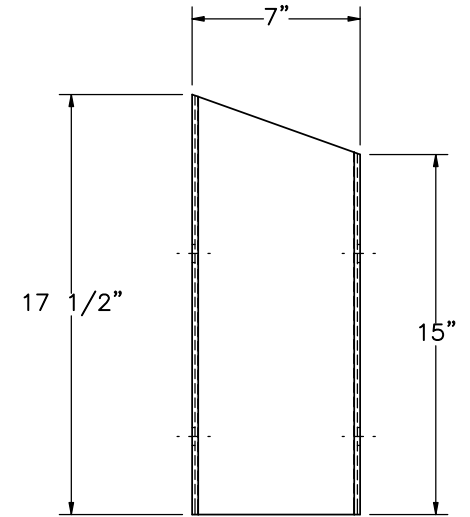
ELEVATION VIEW PROFILE VIEW
Part d3



BACK VIEW



ELEVATION VIEW



PROFILE VIEW

Part d6
SCALE 1:8



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Post Nos. 16-21 Components

DWG. NAME.
FLAGT-1_R9

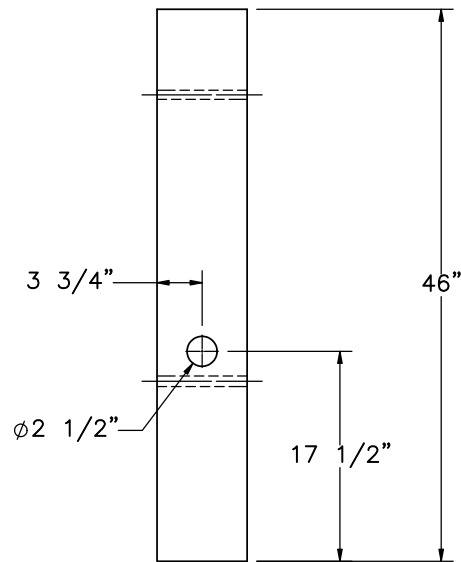
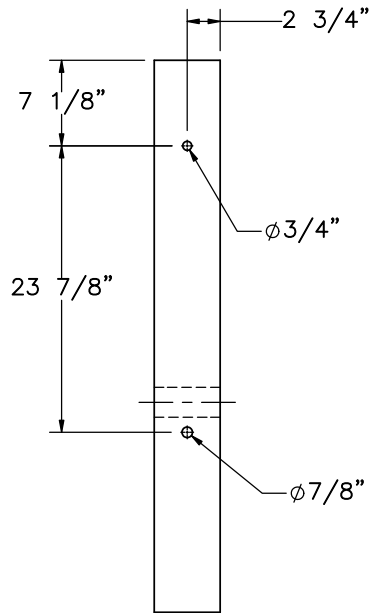
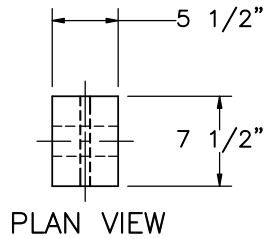
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SHEET:
16 of 27

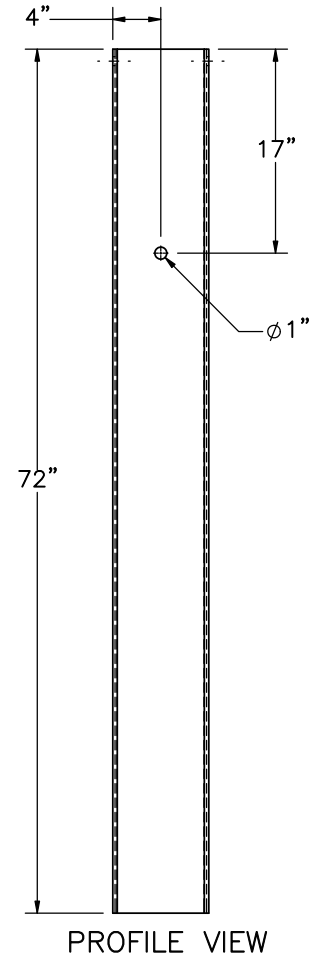
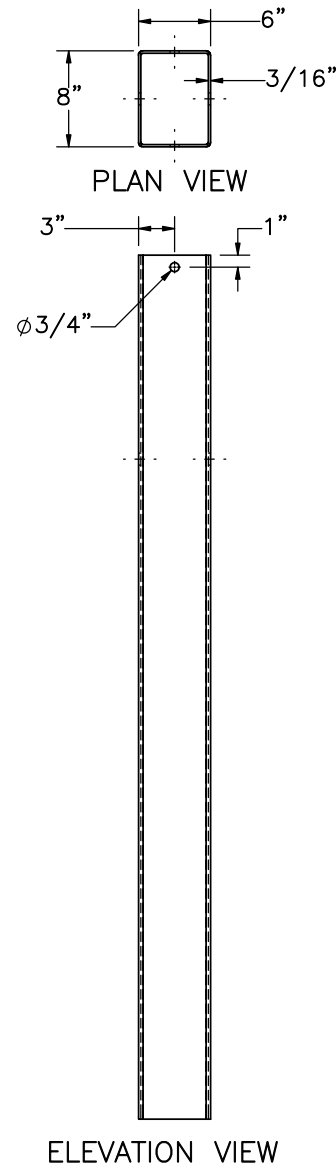
DATE:
3/19/2021

DRAWN BY:
LJF/JRF/SB
W/GHR

REV. BY:
RFB/KAL



Part c1



Part c2



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

BCT Timber Post and
Foundation Tube Details

DWG. NAME.
FLAGT-1_R9

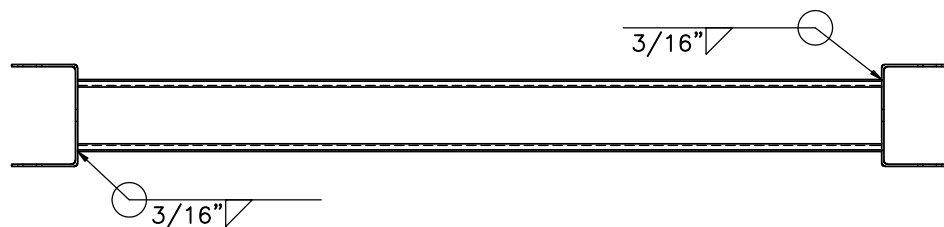
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SHEET:
17 of 27

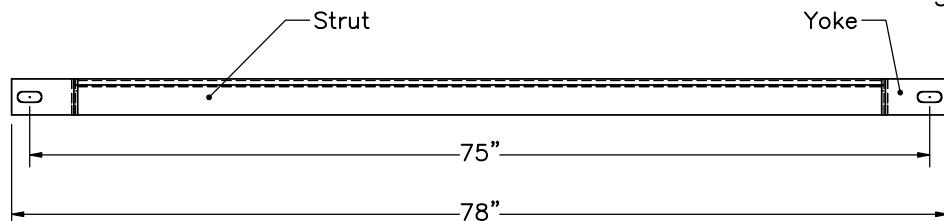
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3/19/2021

DRAWN BY:
LJF/JRF/SB
W/GHR

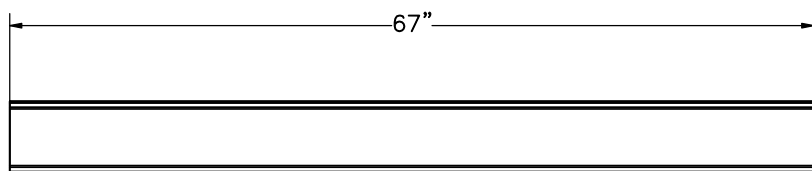
REV. BY:
RFB/KAL



PLAN VIEW

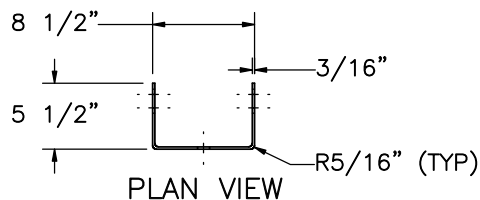


ELEVATION VIEW
Part c3

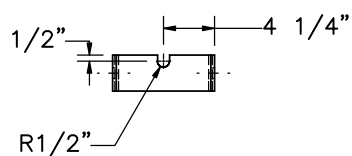


ELEVATION VIEW

6"x3" 10 Gauge Strut

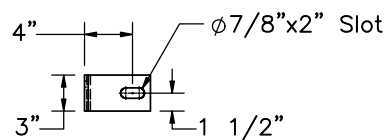


PLAN VIEW

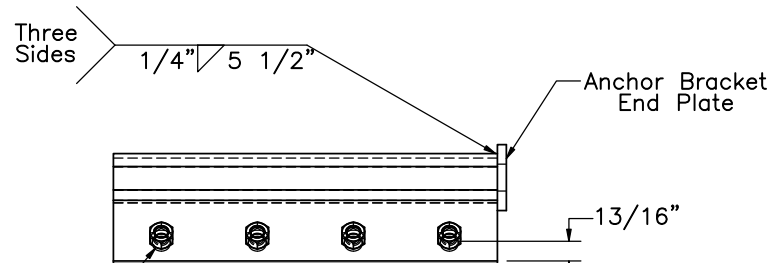


ELEVATION VIEW

Yoke

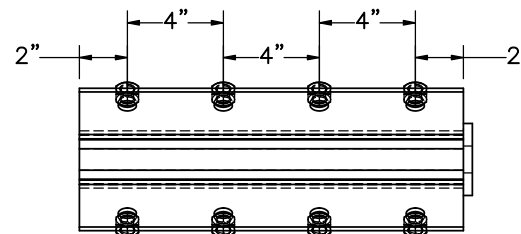


PROFILE VIEW



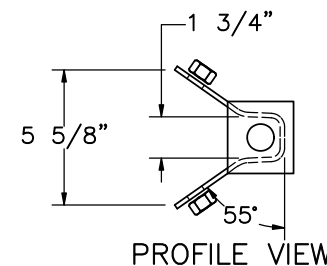
PLAN VIEW

3/4" (TYP)

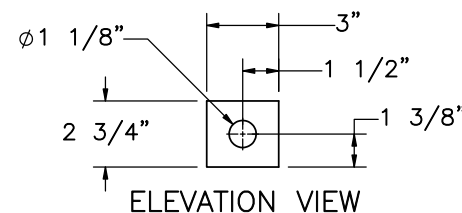


ELEVATION VIEW

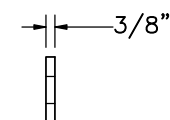
Part c5
SCALE 1:8



PROFILE VIEW



ELEVATION VIEW



PROFILE VIEW

Anchor Bracket End Plate
SCALE 1:8



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Ground Strut Details

DWG. NAME.
FLAGT-1_R9

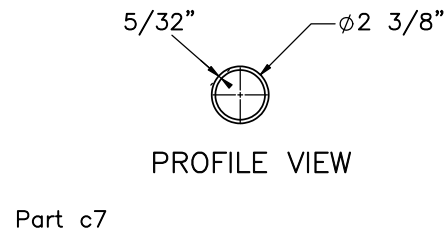
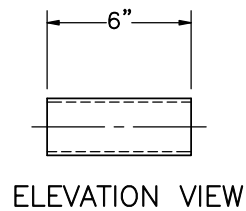
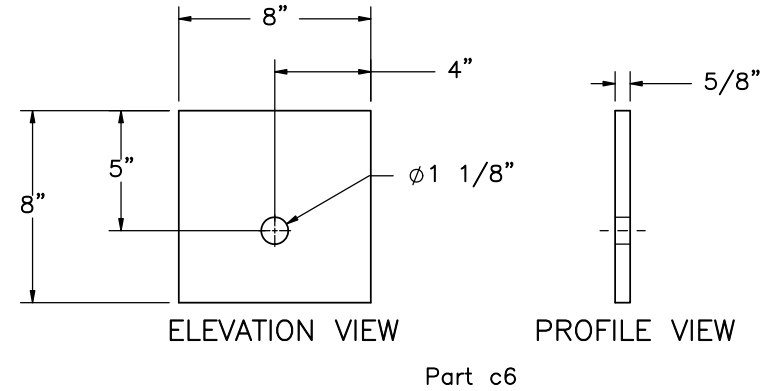
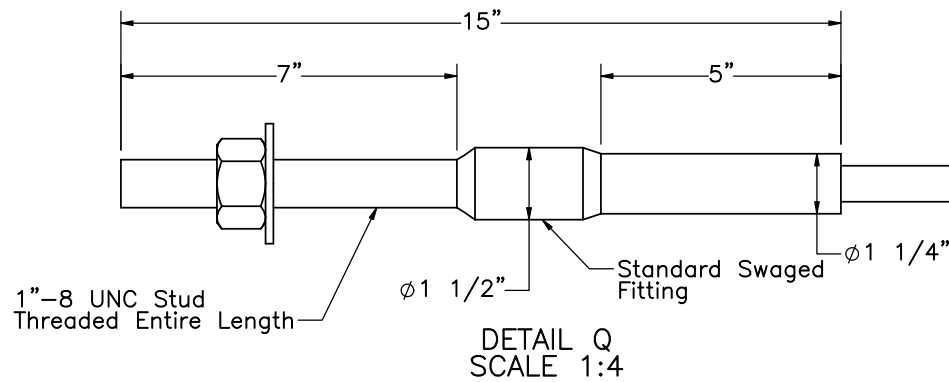
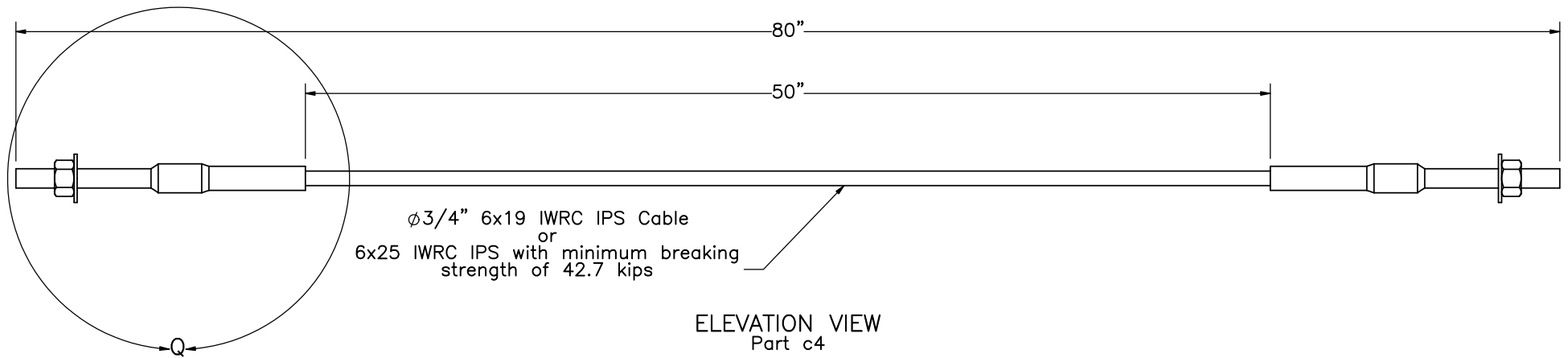
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UNITS: in.

SHEET:
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DATE:
3/19/2021

DRAWN BY:
LJP/JRF/SB
W/GHR

REV. BY:
RFB/KAL



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

BCT Anchor Cable

DWG. NAME.
FLAGT-1_R9

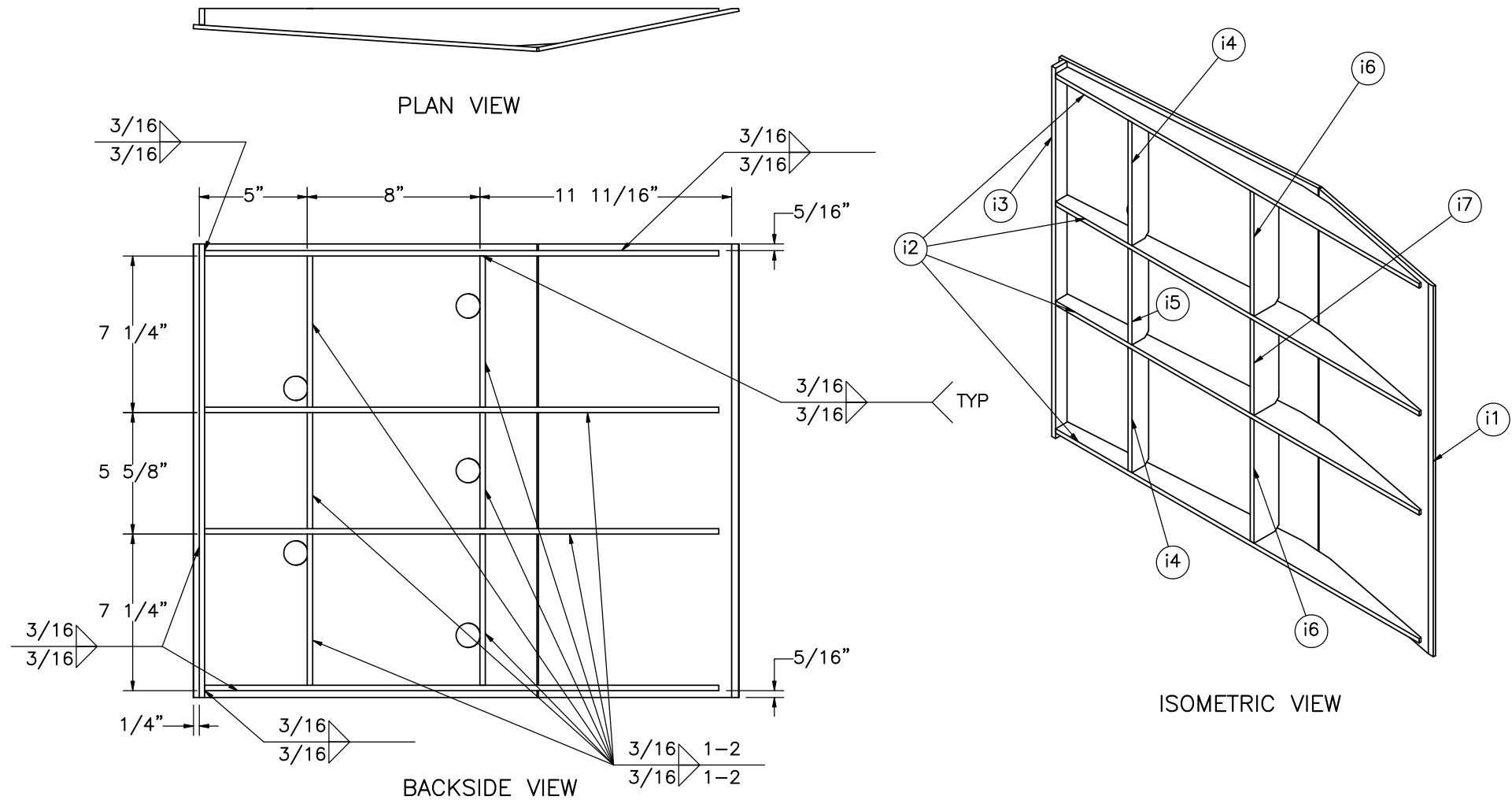
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UNITS: in.

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DATE:
3/19/2021

DRAWN BY:
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W/GHR

REV. BY:
RFB/KAL



Item No.	QTY.	Description	Material Specification	Treatment Specification
-	1	AGT Connector Assembly	ASTM A36	ASTM A123
i1	1	AGT Connector Face Plate	ASTM A36	See Assembly
i2	4	Horizontal Gusset	ASTM A36	See Assembly
i3	1	Vertical Gusset 1	ASTM A36	See Assembly
i4	2	Vertical Gusset 2	ASTM A36	See Assembly
i5	1	Veritcal Gusset 3	ASTM A36	See Assembly
i6	2	Vertical Gusset 4	ASTM A36	See Assembly
i7	1	Vertical Gusset 5	ASTM A36	See Assembly



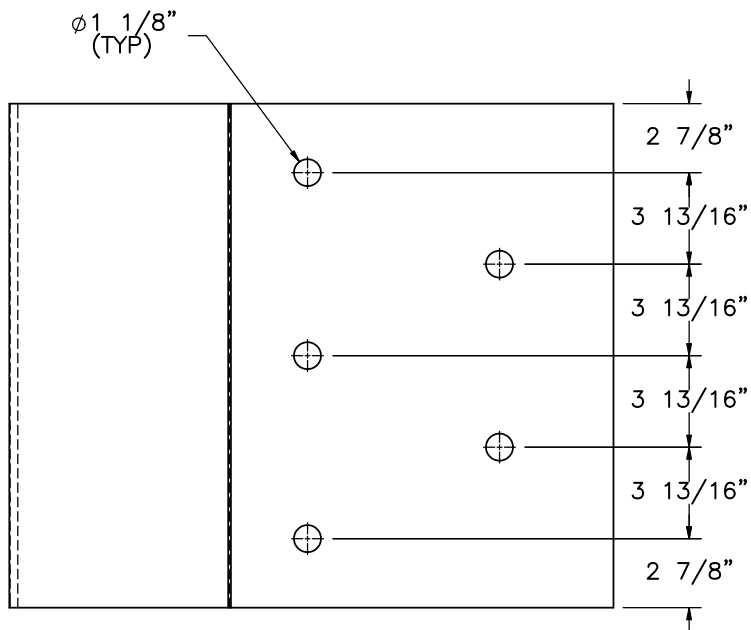
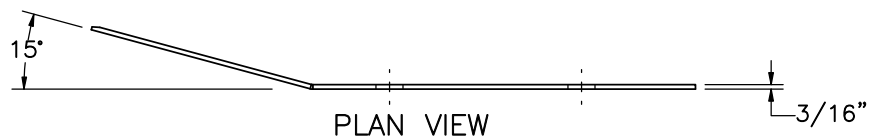
Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1
AGT Connector Assembly

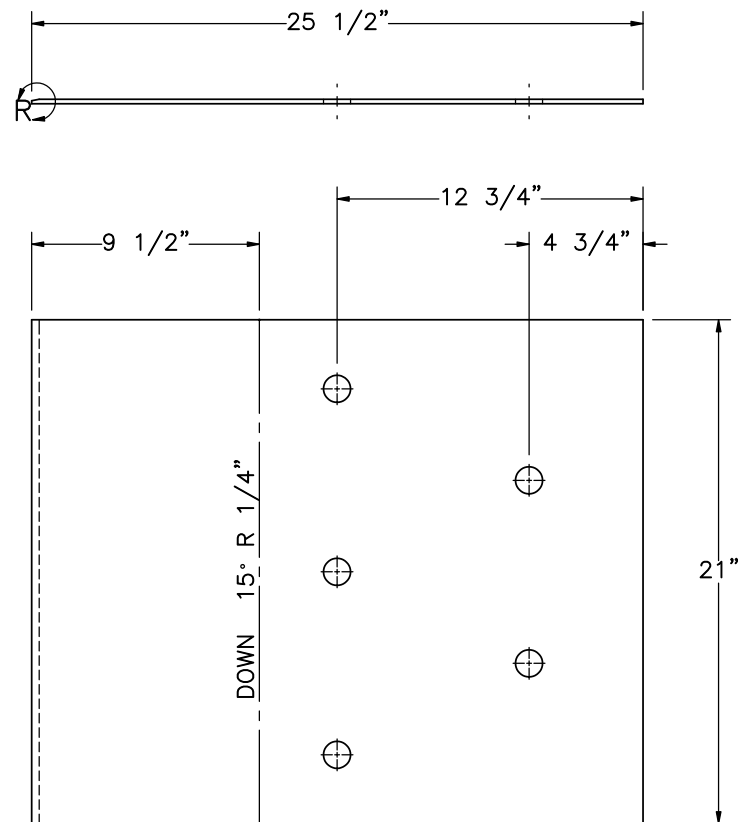
DWG. NAME.
FLAGT-1_R9

SCALE: 1:7
UNITS: in.

SHEET:
20 of 27
DATE:
3/19/2021
DRAWN BY:
LJP/JRF/SB
W/GHR
REV. BY:
RFB/KAL

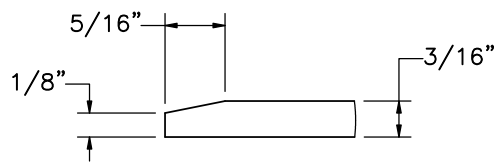


ELEVATION VIEW



FLAT PATTERN

Part i1



DETAIL R
SCALE 1 : 1



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

AGT Connector Face Plate
Details

DWG. NAME.
FLAGT-1_R9

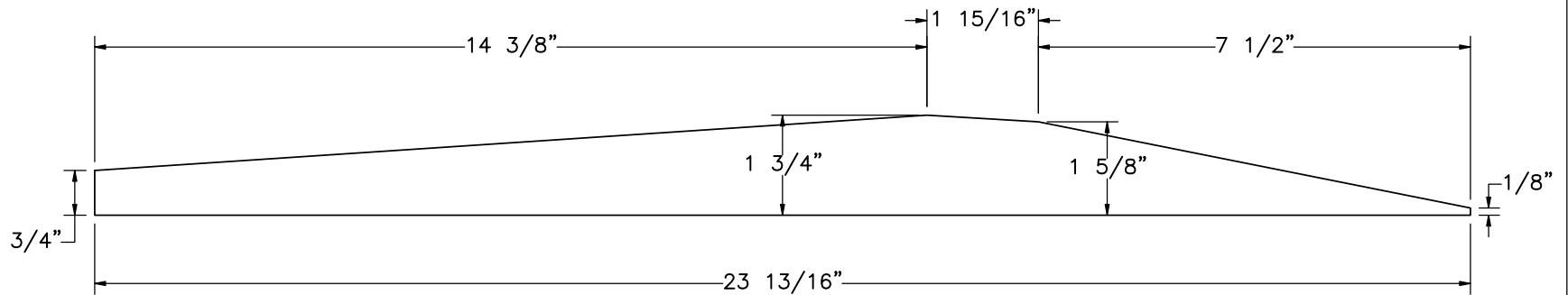
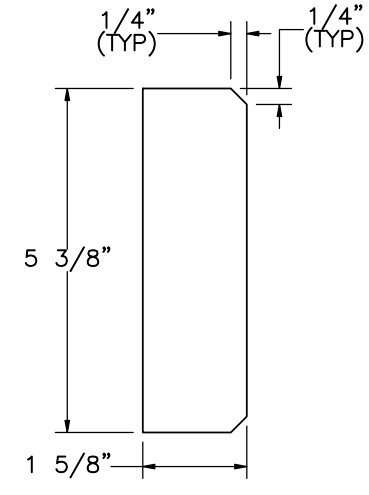
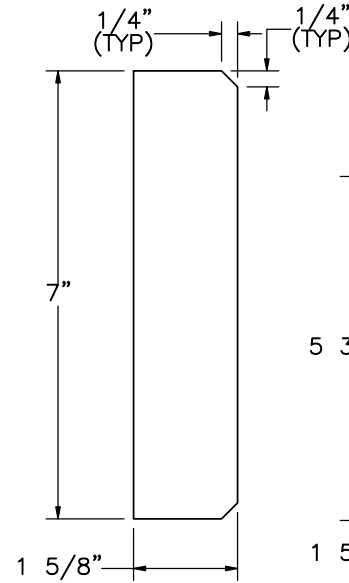
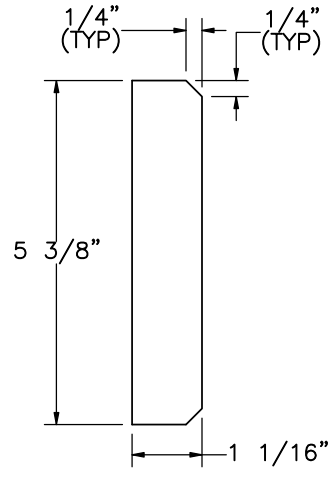
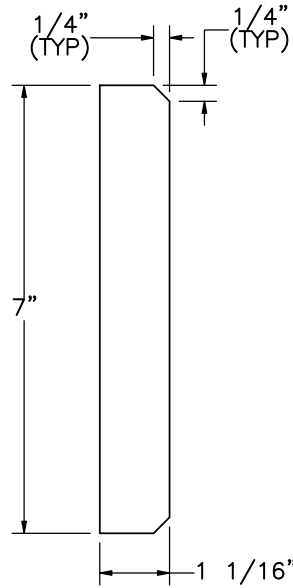
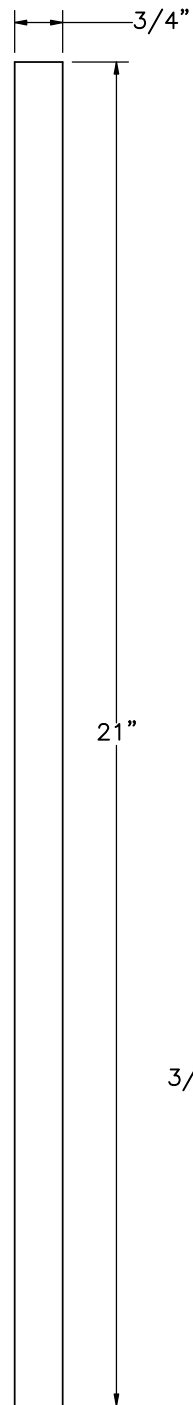
SCALE: 1:8
UNITS: in.

SHEET:
21 of 27

DATE:
3/19/2021

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REV. BY:
RFB/KAL



Note: (1) All parts on this sheet (i2-i7) are 1/4" thick.



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

AGT Connector Assembly
Components

DWG. NAME:
FLAGT-1_R9

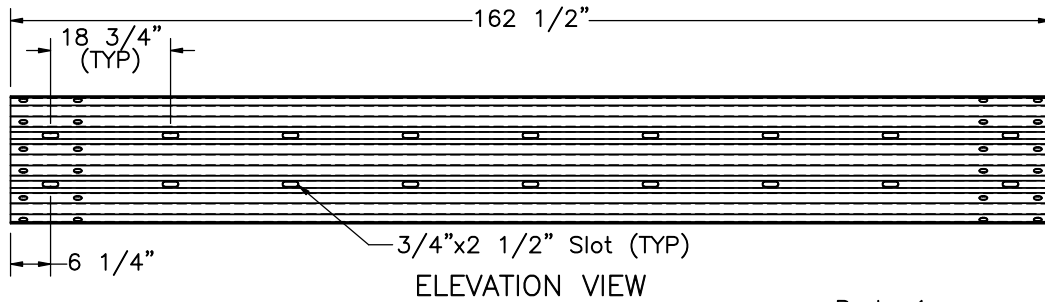
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SHEET:
22 of 27

DATE:
3/19/2021

DRAWN BY:
LJF/JRF/SB
W/GHR

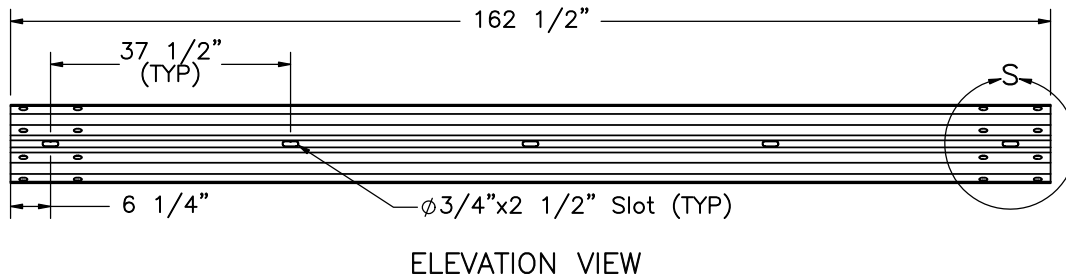
REV. BY:
RFB/KAL



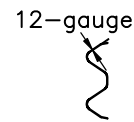
Part a1



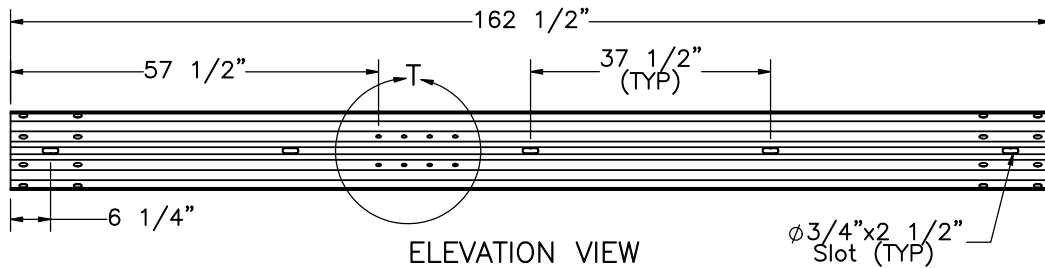
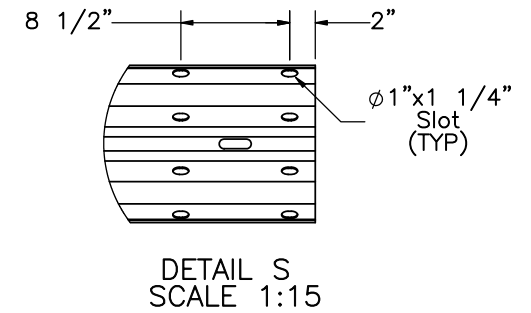
PROFILE VIEW



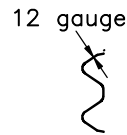
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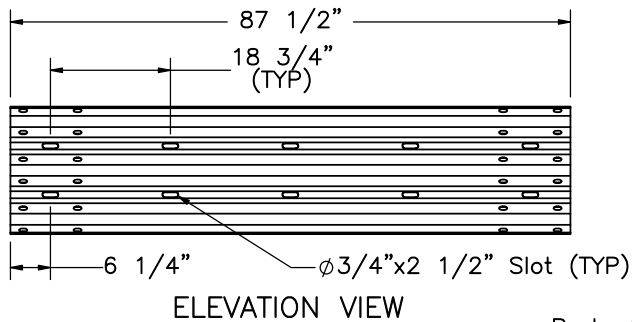
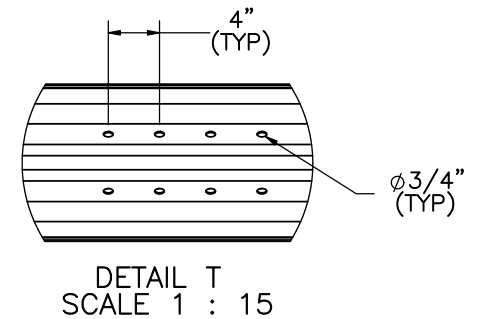
PROFILE VIEW



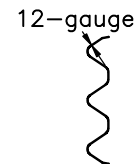
Part a5



PROFILE VIEW



Part a2



PROFILE VIEW



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Guardrail Section Details

DWG. NAME.
FLAGT-1_R9

SCALE: 1:30
UNITS: in.

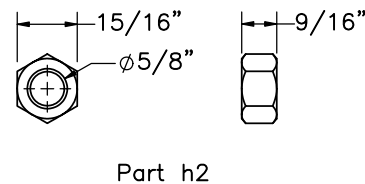
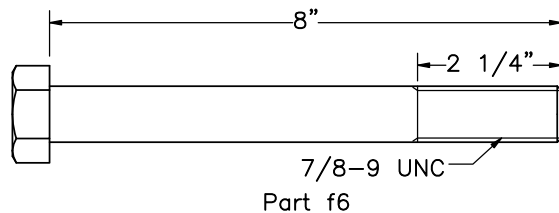
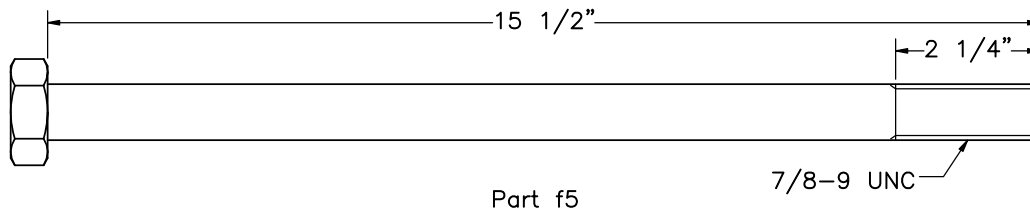
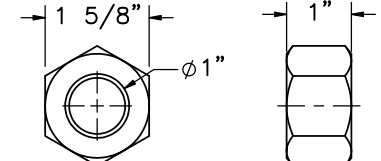
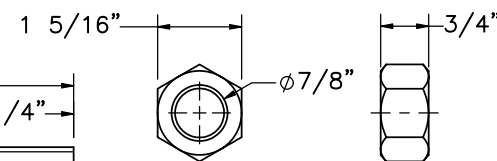
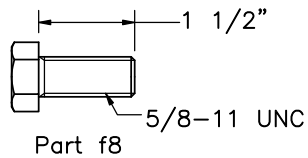
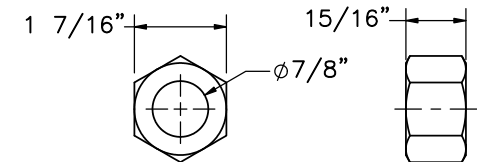
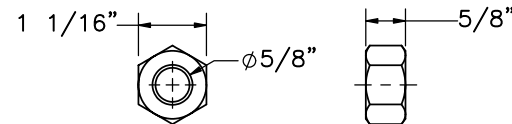
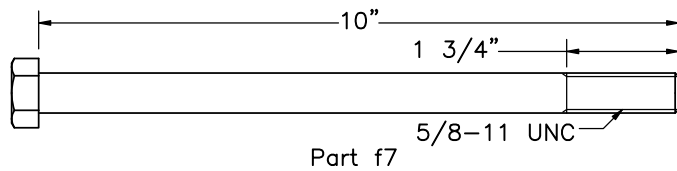
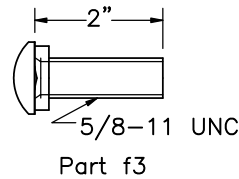
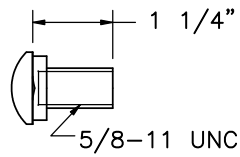
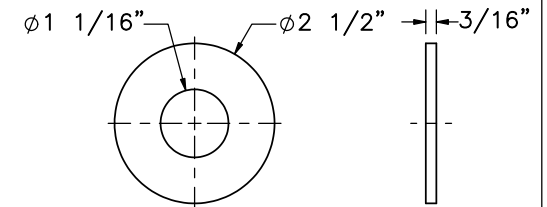
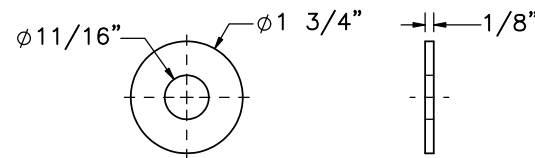
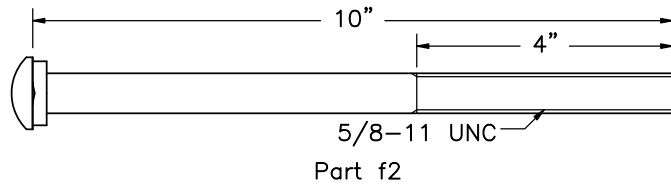
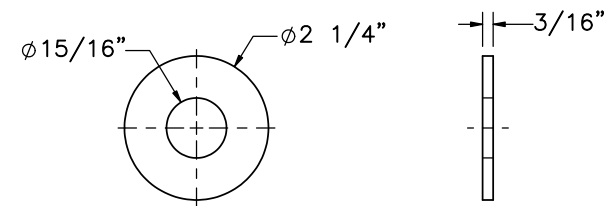
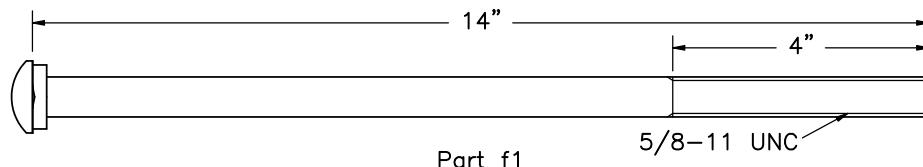
SHEET:
23 of 27

DATE:
3/19/2021

DRAWN BY:
LJP/JRF/SB
W/GHR

REV. BY:
RFB/KAL

	Flared AGT Buttress Test No. FLAGT-1		SHEET: 24 of 27
	Rail Transition and Component Details		DATE: 3/19/2021
Midwest Roadside Safety Facility	DWG. NAME: FLAGT-1_R9	SCALE: 1:15 UNITS: in.	DRAWN BY: LJP/JRF/SB W/GHR REV. BY: RFB/KAL



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Hardware

DWG. NAME.
FLAGT-1_R9

SCALE: 1:3
UNITS: in.

SHEET:
25 of 27

DATE:
3/19/2021

DRAWN BY:
LJF/JRF/SB
W/GHR

REV. BY:
RFB/KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
a1	2	12'-6" 12-gauge Thrie Beam Section	AASHTO M180	ASTM A123 or A653	RTM08a
a2	1	6'-3" 12-gauge Thrie Beam Section	AASHTO M180	ASTM A123 or A653	RTM19a
a3	1	6'-3" 10-gauge W-Beam to Thrie-Beam Asymetric Transition Section	AASHTO M180	ASTM A123 or A653	RWT02
a4	4	12'-6" 12-gauge W-Beam MGS Section	AASHTO M180	ASTM A123 or A653	RWM04a
a5	1	12'-6" 12-gauge W-Beam MGS End Section	AASHTO M180	ASTM A123 or A653	RWM14a
a6	1	10-gauge Thrie Beam Terminal Connector	AASHTO M180 Gr. 50 Min. yield strength = 50 ksi Min. ultimate strength = 70 ksi	ASTM A123 or A653	—
b1	1	Concrete — 21.9 cubic ft	Min. f'c = 4,000 psi	—	—
c1	2	BCT Timber Post — MGS Height	SYP Grade No. 1 or better (No knots +/- 18" from ground on tension face)	—	PDF01
c2	2	72" Long Foundation Tube	ASTM A500 Gr. B	*ASTM A123	PTE06
c3	1	Ground Strut Assembly	ASTM A36	*ASTM A123	PFP02
c4	1	BCT Cable Anchor Assembly	—	—	FCA01
c5	1	Anchor Bracket Assembly	ASTM A36	*ASTM A123	FPA01
c6	1	8"x8"x5/8" Anchor Bearing Plate	ASTM A36	*ASTM A123	FPB01
c7	1	2 3/8" O.D. x 6" Long BCT Post Sleeve	ASTM A53 Gr. B Schedule 40	*ASTM A123	FMM02
d1	7	W6x8.5 or W6x9, 72" Long Steel Post	ASTM A992	*ASTM A123	PWE06
d2	6	W6x8.5 or W6x9, 72" Long Steel Post	ASTM A992	*ASTM A123	PWE06
d3	6	W6x8.5 or W6x9, 78" Long Steel Post	ASTM A992	*ASTM A123	—
d4	7	6"x12"x14 1/4" Timber Blockout	SYP Grade No.1 or better	—	PDB10a
d5	6	6"x12"x19" Timber Blockout	SYP Grade No.1 or better	—	—
d6	6	17 1/2" Long, 7"x4"x3/16" Iowa Steel Blockout	ASTM A500 Gr. B	*ASTM A123	—
d7	9	16D Double Head Nail	—	—	—
e1	12	86" Unbent Length #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
e2	1	62 3/4" Unbent Length #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
e3	1	60 1/2" Unbent Length #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
e4	1	59 1/4" Unbent Length #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
e5	1	74 3/4" Unbent Length #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
e6	3	37 1/4" Long #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
e7	2	80 1/4" Unbent Length #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
e8	4	85 1/2" Unbent Length #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—

* Component does not need to be galvanized for testing purposes.

** Rebar does not need to be epoxy-coated for testing purposes.

Note: (1) Quantities listed herein are only for 1 system installation.
(2) For testing purposes part b1 used NE Mix 47B1S/1PF4000HW.



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Bill of Materials

DWG. NAME.
FLAGT-1_R9

SCALE: None
UNITS: in.

SHEET:
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DATE:
3/19/2021

DRAWN BY:
LJP/JRF/SB
W/GHR

REV. BY:
RFB/KAL

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
e9	5	80" Long #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
e10	1	80 1/2" Unbent Length #4 Rebar	ASTM A615 Gr. 60	**Epoxy Coated (ASTM A775 or A934)	—
f1	18	5/8" Dia. UNC, 14" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB06
f2	2	5/8" Dia. UNC, 10" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB03
f3	24	5/8" Dia. UNC, 2" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB02
f4	56	5/8" Dia. UNC, 1 1/4" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBB01
f5	5	7/8 Dia. UNC, 15 1/2" Long Heavy Hex Head Bolt	ASTM F3125 Gr. 120 (A325) or A354 Gr. BC	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329 or F2833 Gr. 1	FBX22b
f6	2	7/8" Dia. UNC, 8" Long Hex Head Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	—
f7	2	5/8" Dia. UNC, 10" Long Hex Head Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBX16a
f8	20	5/8" Dia. UNC, 1 1/2" Long Hex Head Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F2329	FBX16a
g1	4	7/8" Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	—
g2	46	5/8" Dia. Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC16a
g3	5	3"x3"x1/4" or 3 1/2"x3 1/2"x1/4" Square Washer Plate	ASTM A572 Gr. 50	*ASTM A123	—
g4	2	1" Dia. Plain Round Washer	ASTM F844	ASTM A153 (AASHTO M232) for Class D or ASTM B695 (AASHTO M298) for Class 50	FWC24a
h1	102	5/8" Dia. Heavy Hex Nut	ASTM A563A	ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50	—
h2	20	5/8" Dia. Hex Nut	ASTM A563A	ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50	—
h3	5	7/8" Dia. UNC Heavy Hex Nut	ASTM A563DH or A194 Gr. 2H	—	—
h4	2	7/8" Dia. Hex Nut	ASTM A307	ASTM A153 (AASHTO M232) for Class C or ASTM B695 (AASHTO M298) for Class 50	—
h5	2	1"—8 UNC Heavy Hex Nut	ASTM A563DH or equivalent	ASTM A153 or B695 Class 55 or F2329	FNX24b
i1	1	AGT Connector Face Plate	ASTM A36	See Assembly	—
i2	4	Horizontal Gusset	ASTM A36	See Assembly	—
i3	1	Vertical Gusset 1	ASTM A36	See Assembly	—
i4	2	Vertical Gusset 2	ASTM A36	See Assembly	—
i5	1	Vertical Gusset 3	ASTM A36	See Assembly	—
i6	2	Vertical Gusset 4	ASTM A36	See Assembly	—
i7	1	Vertical Gusset 5	ASTM A36	See Assembly	—

* Component does not need to be galvanized for testing purposes.
** Rebar does not need to be epoxy-coated for testing purposes.



Midwest Roadside
Safety Facility

Flared AGT
Buttress
Test No. FLAGT-1

Bill of Materials

DWG. NAME.
FLAGT-1_R9

SCALE: None
UNITS: in.

SHEET:
27 of 27

DATE:
3/19/2021

DRAWN BY:
LJP/JRF/SB
W/GHR

REV. BY:
RFB/KAL

REV.	DATE OF ISSUE	Page	NATURE OF CHANGES	REVIEWER	REVISED BY
0	6/1/2020	–	Original drawing created from AGTB-2 drawing	–	LJP
1	6/10/2020	1	Added test details to notes.	RFB	LJP
		3	Added first post offset dimension. Added notes 2–4.		
		8	Added note 1.		
		11	Changed dimensions to be to center of rebar.		
		22	Fixed terminal connector part number.		
		23	Added parts g4, h3, h6.		
		BOM	QTY: a4, f3, g2, h1 Added parts g4, h3, h4.		
2	8/10/2020	ALL	Replaced the bent thrie beam with an angled connector plate	RFB	JRF
		1	Edited notes to remove notes 1–4. Added impact notes for three tests		
		3	Edited notes 3 and 4 for clarity.		
		9	Added Isometric view to clearly show chamfers		
		20	Added page. Added views for AGT connector assembly		
		21	Added page. Added face plate component views		
		22	Added page. Added gusset plate views		
		24	Replaced part a6 with a similar part that has vertical instead of angled slots.		
		BOM	Updated part number and Added parts i1–i7		
3	8/26/2020	1	Changed FLAGT-2 Impact note. Changed notes 1 and 3 to 6 and 8 respectively. Added note 1 on mash designations for tests, edited note 2 to include critical region for test 3, added notes 3–5 on test impact locations.	RFB	SBW
		3	Added splice bolts nuts and washers.		
		20	Reordered parts i2 and i3.		
		21	Added Dimensions to holes on part i1.		
		23	Added 12'–6" thrie beam to page. Renumbered a series part numbers.		
		24	Renumbered a series part numbers.		
		BOM	Added part a1 to assmeby, renumbered a series part numbers.		

4	9/14/2020	1	Changed splice bolts from f4 to f3 on posts 9, 14 and between posts 6 and 7. Edited note 1 to say tests 2 and 3 are now test designation 3-21. Edited note 2 to reference test 3. Edited notes 3 and 5 for clarity.	RFB	SBW
		3	Added overhead view of buttruss. Removed dangling dimension from detail A. Edited note 2 for clarity.		
		6	Changed splice bolt part no from f4 to f3 on detail G. Added note 2 about Guardrail bolts.		
		7	Added part bubble.		
		8	Added additional nail to detail I. Edited note 1 for clarity. Added note 2.		
		24	Edited dimensioning on part a6 to give proper sizing.		
		25	Edited dimensioning on part h2 to proper hardware guide sizing.		
		BOM	Removed metric sizing on a1. Removed duplicate d7. Reordered part e10. Edited quantities on parts f1 and h1.		
5	10/2/2020	1	Added CIP dimension to test 2. Added test 4. Added note 6 Updated notes.	RFB	CJN
		2	Changed dimesnions on PLAN VIEW.		
		3	Added dimesnion to detail A. Remvoed hidden lines for clarity in detail A, B and section C-C.		
		6	Added the corect view to show the backside of the guardrail.		
		21	Renamed detail view to R.		
		24	Noted that the slots on part a6 are vertical slots.		
		BOM	Changed qunatities for f3 and f4.		
6	10/16/2020	1	Edited notes 2 and 8.	RFB	LJP
		2	Combined spacing dimension for posts 12-21 and added 2nd note.		
		3	Hid reinforcement in detail A. Edited part balloons. Added dimension from buttruss to center of post.		
		6	Changed bolts in W-beam splice from f4 to f3.		
		13	Changed rounding of angle dimensions.		

		21	Changed rounding of angle dimensions.		
		22	Changed part i2 angled dimensions to be horizontal/vertical dimensions.		
		BOM	Matl: i1-i7 Treatment: i1-i7		
7	11/11/2020	—	System was flipped. Changed part h1 from hex to heavy hex nut, used in splices and rail/post connections. Added part h2 for regular hex nut, used in anchor bracket and posts 16–21.	JCH/SKR	LJP
		BOM	Added part h2. Edited concrete mix spec.		
8	3/19/2021	1	Edited test all test notations and flipped test 1 and 2 on system drawing.	KAL	SBW
		BOM	Changed part b1 material specs, Added note on testing mix used for part b1.		
9	7/28/2021	All	Name changed to FLAGT-1.	KAL	GHR
		1	Removed test nos. 2–4 and corresponding notes and dimensions. (test nos. 2–4 were added to the new drawing set FLAGT-2–5)		