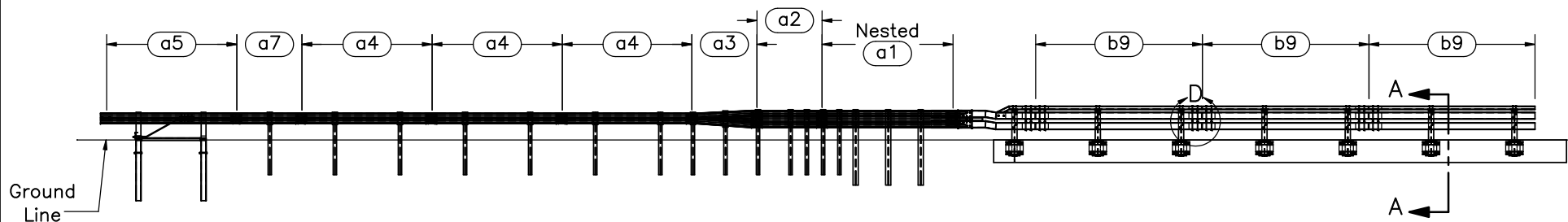


PLAN VIEW



ELEVATION VIEW

- Notes: (1) Tests shall be performed according to test designation nos. 3-20 and 3-21 using MASH 2016 criteria.
- (2) Test no. STBRT-1 shall be performed according to MASH test 3-20 with the impact point located 30" upstream from the centerline of post 19
- (3) Test no. STBRT-2 shall be performed according to MASH test 3-21 with the impact point located 17" upstream from the centerline of post 19
- (4) Critical region is located between post nos. 13 and 19.
- (5) Anchor posts are placed in $\phi 3'$ holes, then backfilled and tamped with soil.
- (6) The details of the existing bridge deck can be found in STBR-3.
- (7) Quantities listed herein are only for one copy of the system.
- (8) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

System Layout

DWG. NAME.
STBRT 1-2_R14

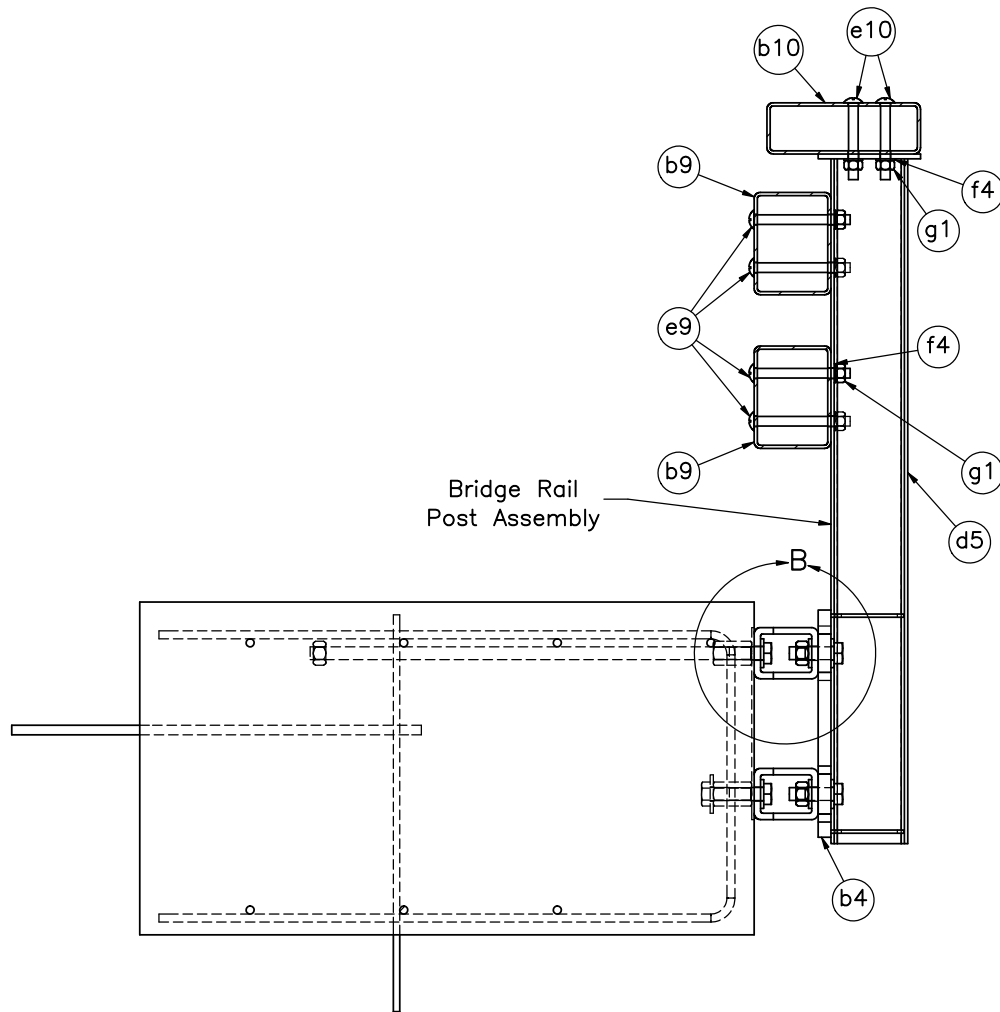
SCALE: 1:180
UNITS: in.

SHEET:
1 of 35

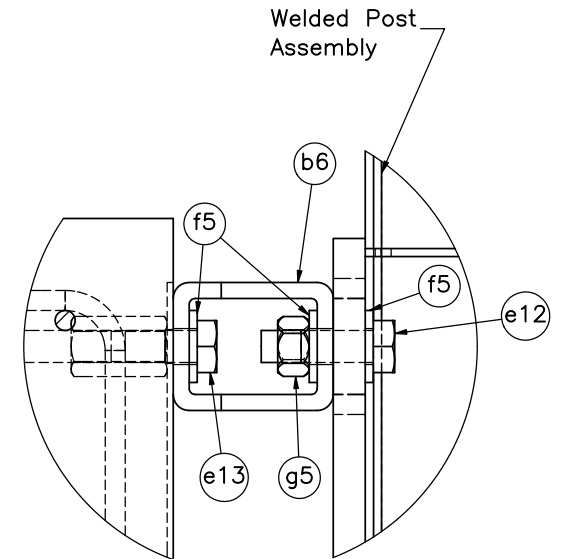
DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SBW

REV. BY:
JEK/SKR/JDR



SECTION A-A
Post Nos. 20-26



DETAIL B
SCALE 1:6

- Notes: (1) Two f4 washers can be used if e10 bolt thread length exists, which is necessary to properly tighten nut.
(2) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

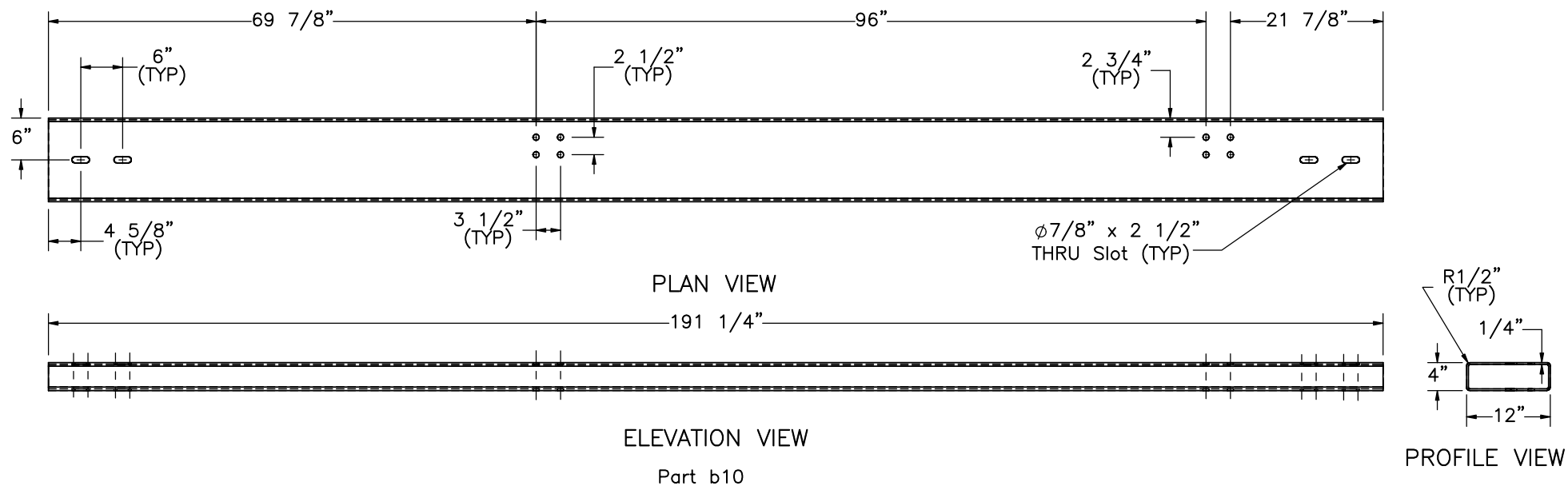
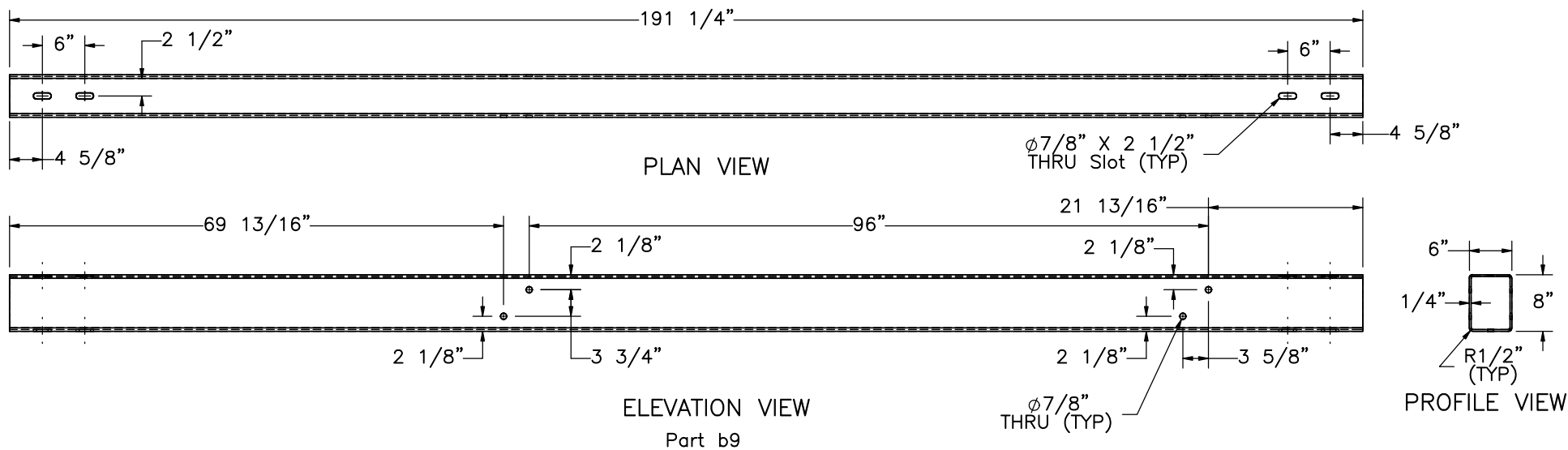
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Bridge Rail Post Sections

DWG. NAME:
STBRT 1-2_R14

SCALE: 1:15
UNITS: in.

SHEET:
2 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR
/JDR



Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

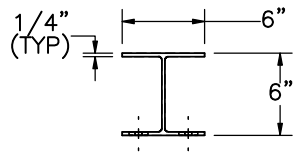
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Box Beam Rail Components

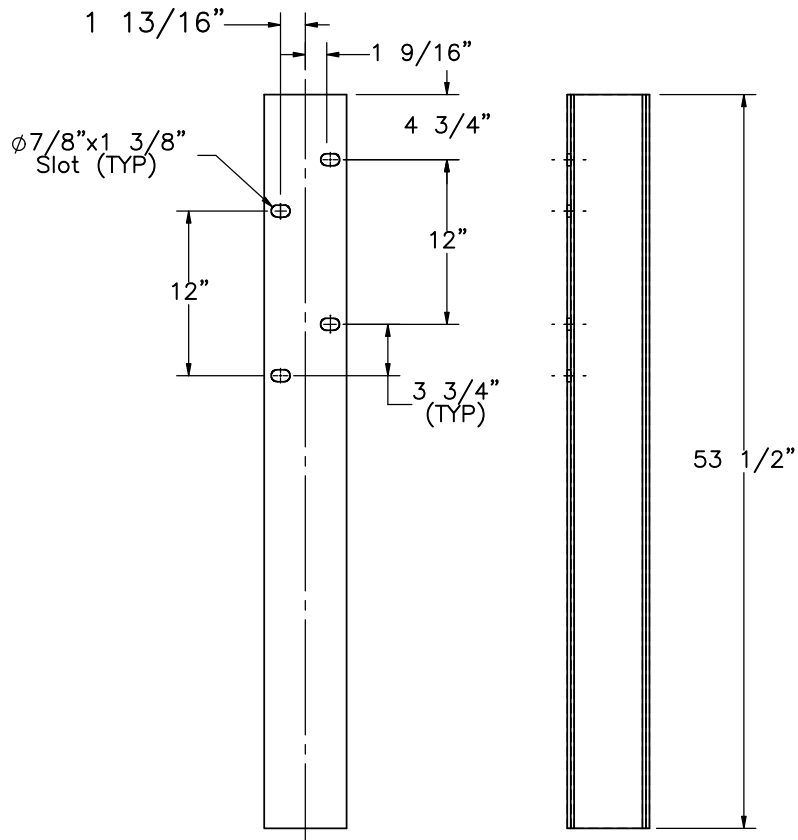
DWG. NAME.
STBRT 1-2_R14

SCALE: 1:22
UNITS: in.

SHEET:
3 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR



PLAN VIEW

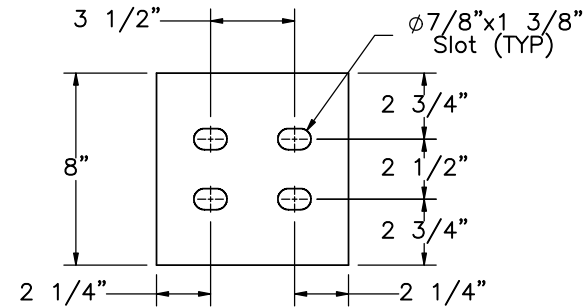


ELEVATION VIEW

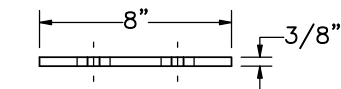
PROFILE VIEW

Part d5
SCALE 1:14

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.

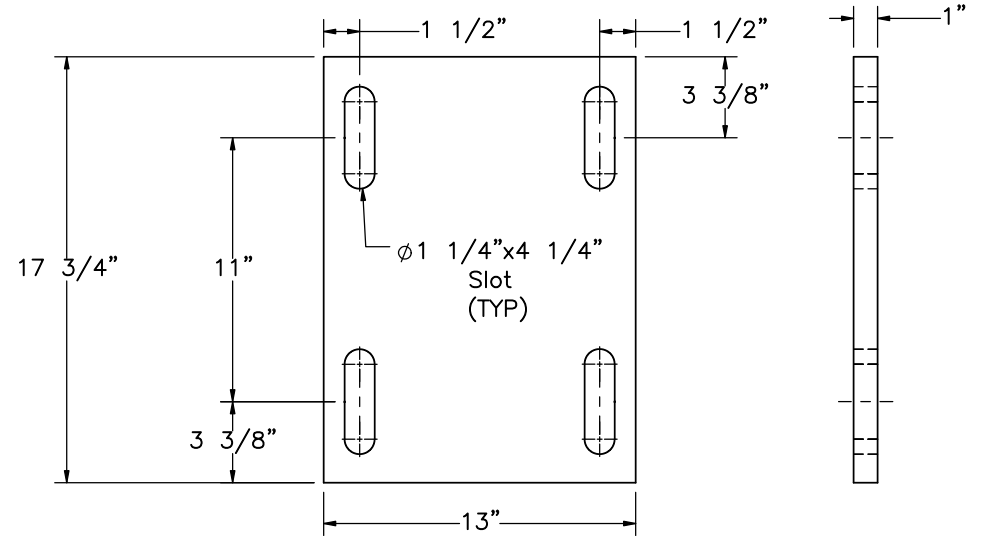


PLAN VIEW



ELEVATION VIEW

Part b3



ELEVATION VIEW

PROFILE VIEW

Part b4



Midwest Roadside
Safety Facility

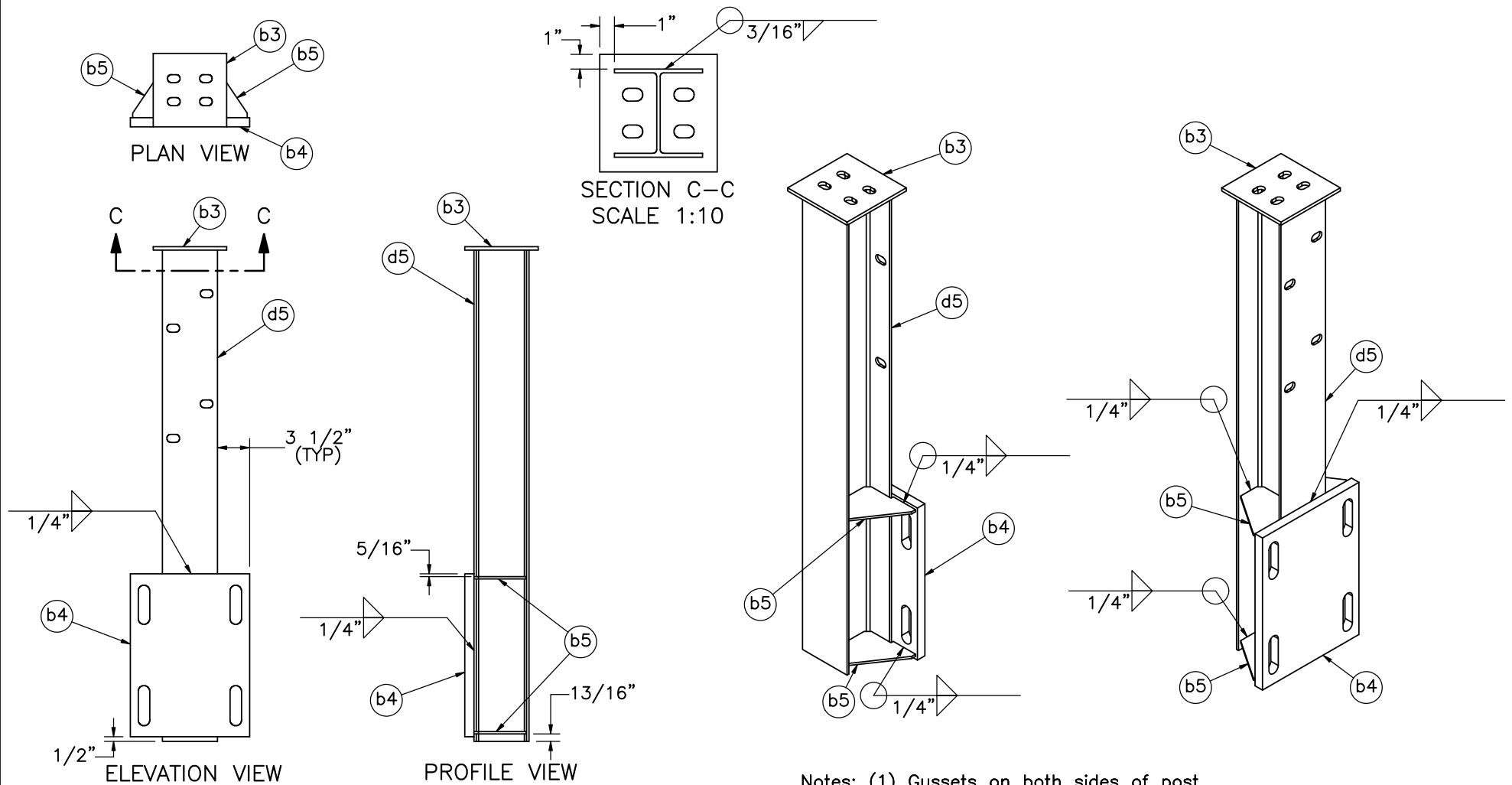
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Bridge Rail Post Components

DWG. NAME.
STBRT 1-2_R14

SCALE: 1:8
UNITS: in.

SHEET:
4 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SB
W
REV. BY:
JEK/SKR/J
DR



- Notes:
- (1) Gussets on both sides of post.
 - (2) To prevent welds to end at edges of gussets, leave 5/16" of base material beyond weld to edge of welded part.
 - (3) Leave coped corners of gussets open for drainage. Do not fill with welds.
 - (4) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	7	Welded Post Assembly	—	ASTM A123
b3	1	8"x8"x3/8" Plate	ASTM A572 Gr. 50	See Assembly
b4	1	17 3/4"x13"x1" Post Plate	ASTM A572 Gr. 50	See Assembly
b5	4	6 1/8"x5 11/16"x1/4" Gusset Plate	ASTM A572 Gr. 50	See Assembly
d5	1	W6x15, 53 1/2" Long Post	ASTM A992	See Assembly



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Welded Post Assembly

DWG. NAME.
STBRT 1-2_R14

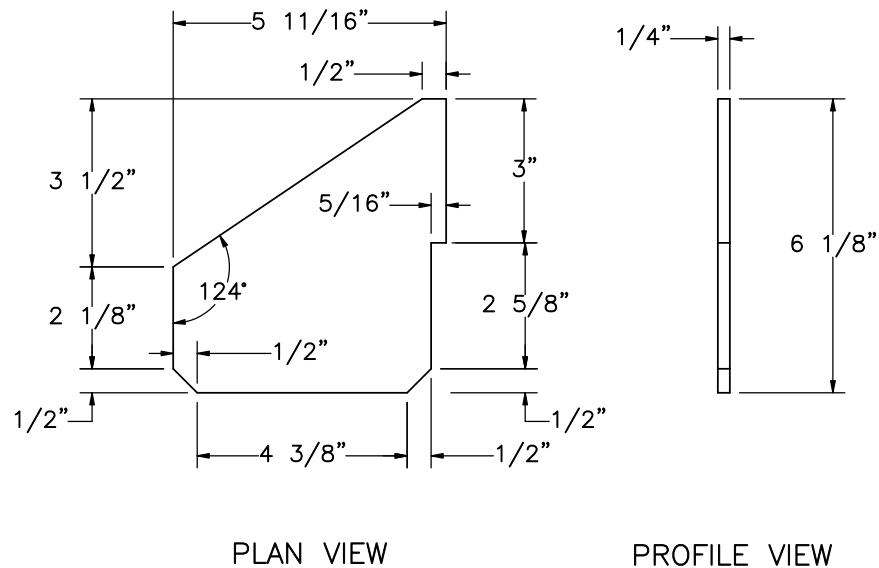
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UNITS: in.

SHEET:
5 of 35

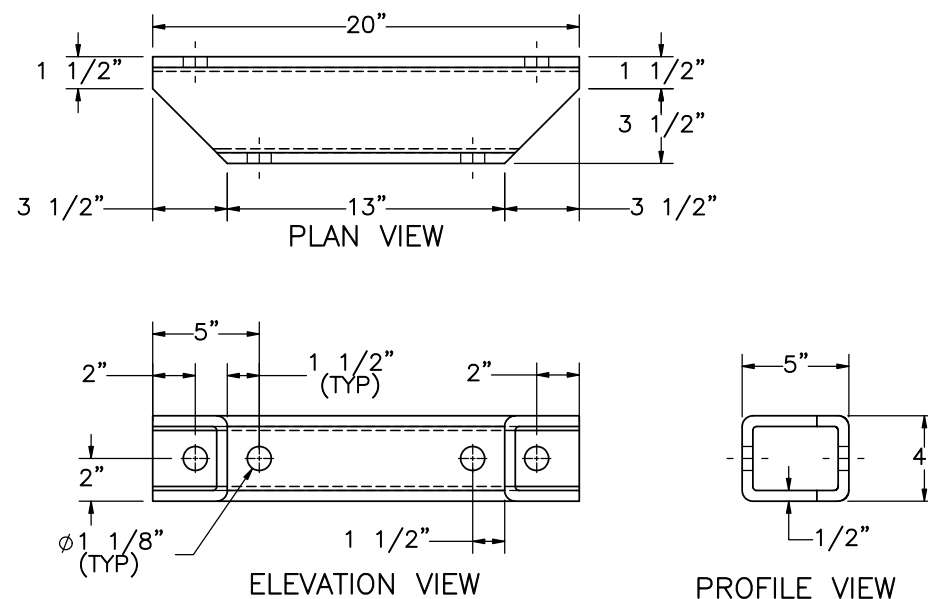
DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SBW

REV. BY:
JEK/SKR/JDR



Part b5
SCALE 1:4



Part b6

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

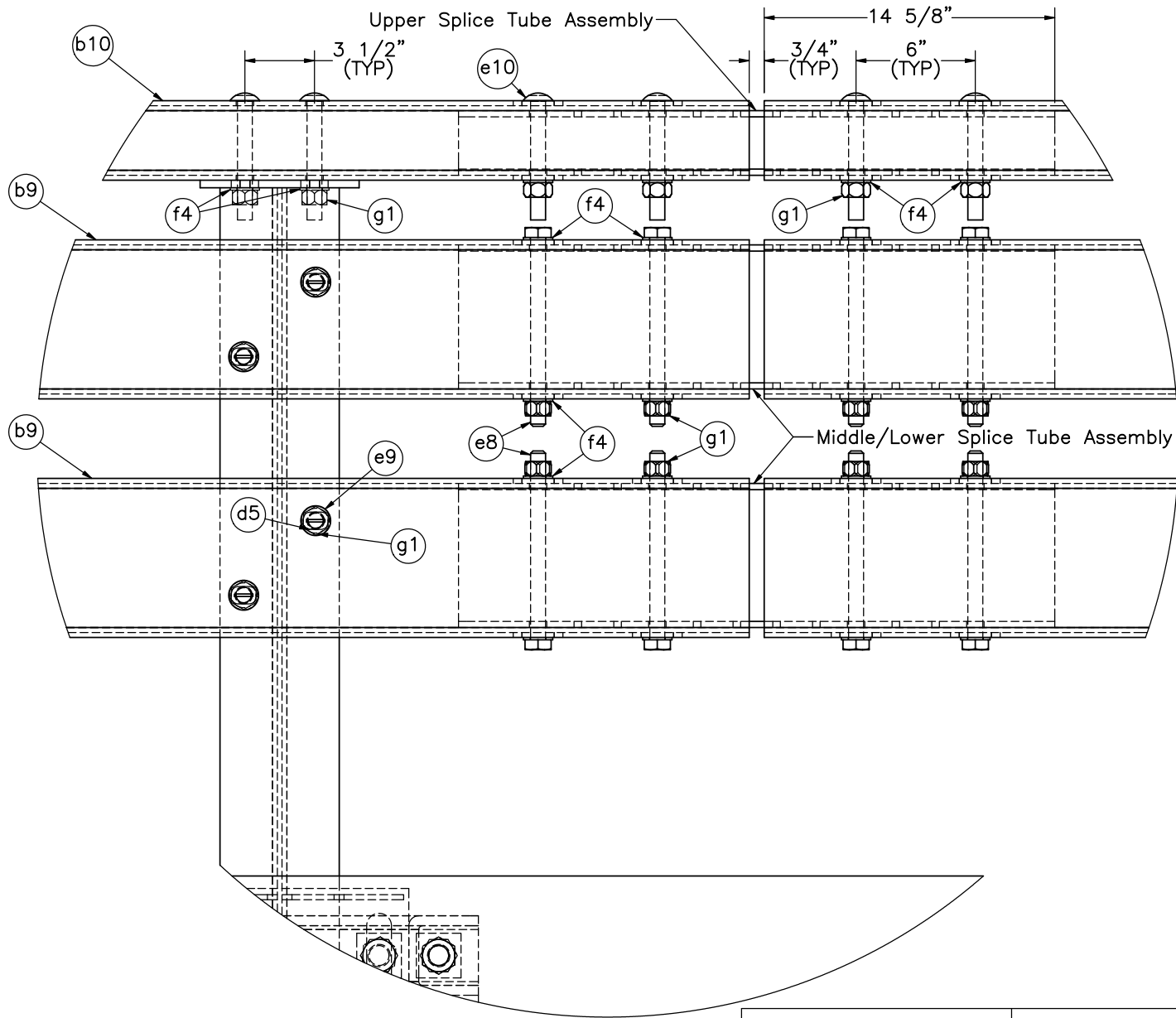
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Bridge Rail Post Components

DWG. NAME:
STBRT 1-2_R14

SCALE: 1:9
UNITS: in.

SHEET:
6 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR



DETAIL D

- Notes: (1) Two g4 washers can be used if inadequate f10 bolt thread length exists, which is necessary to properly tighten nut.
- (2) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Bridge Rail Splice Details

DWG. NAME:
STBRT 1-2_R14

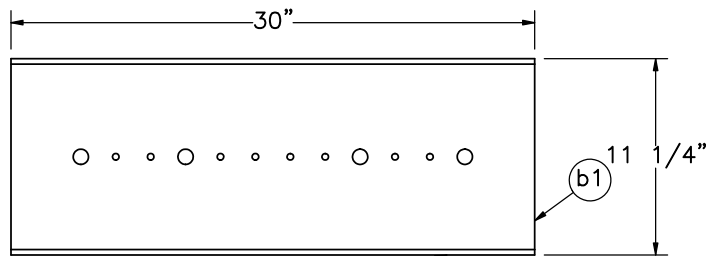
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UNITS: in.

SHEET:
7 of 35

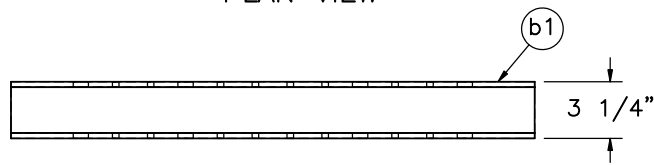
DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SBW

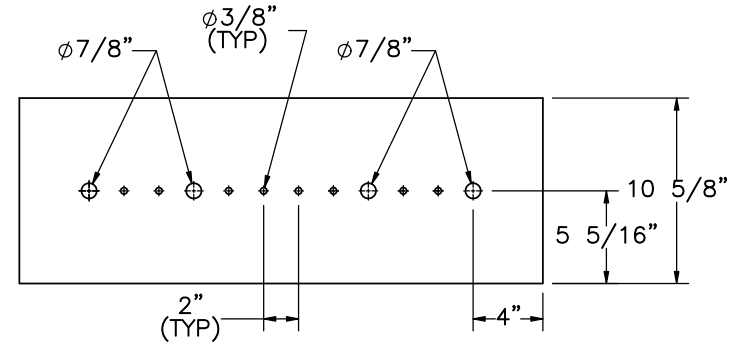
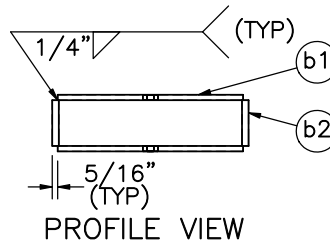
REV. BY:
JEK/SKR/JDR



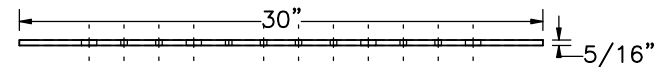
PLAN VIEW



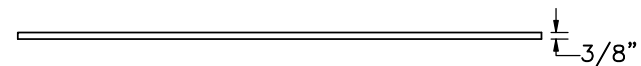
ELEVATION VIEW
Upper Splice Tube Assembly



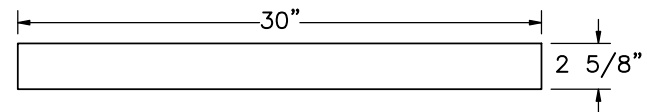
PLAN VIEW



ELEVATION VIEW
Part b1



PLAN VIEW



ELEVATION VIEW
Part b2

- Notes: (1) To help hold the shape of the splice assembly through the welding and galvanizing processes, it is recommended to use gussets or shim blocks.
(2) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	3	Upper Splice Tube Assembly – Option 1	—	ASTM A123
b1	2	30"x10 5/8"x5/16" Plate	ASTM A572 Gr. 50	See Assembly
b2	2	30"x2 5/8"x3/8" Plate	ASTM A572 Gr. 50	See Assembly



Midwest Roadside
Safety Facility

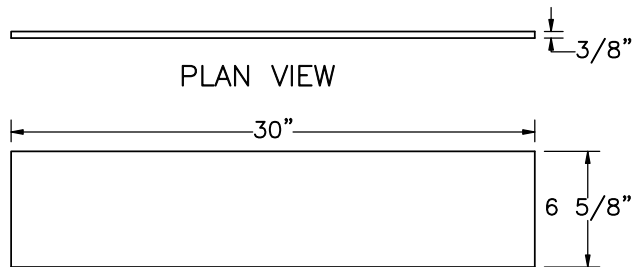
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Upper Splice Tube Assembly

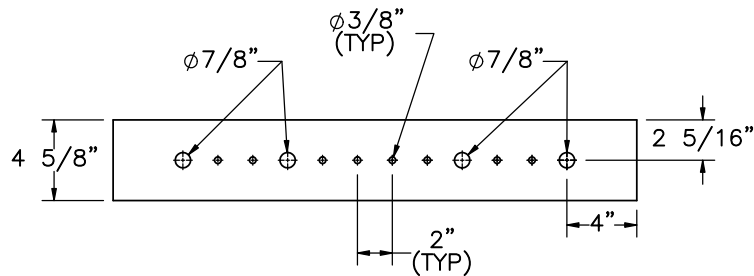
DWG. NAME.
STBRT 1-2_R14

SCALE: 1:11
UNITS: in.

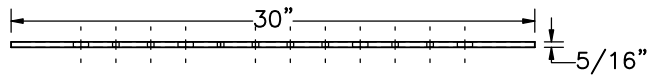
SHEET:
8 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR



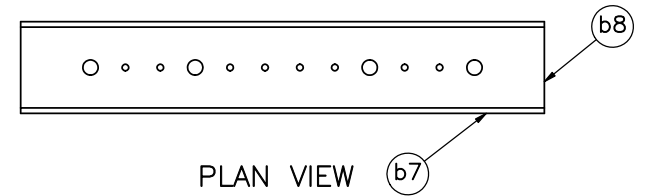
ELEVATION VIEW
Part b7



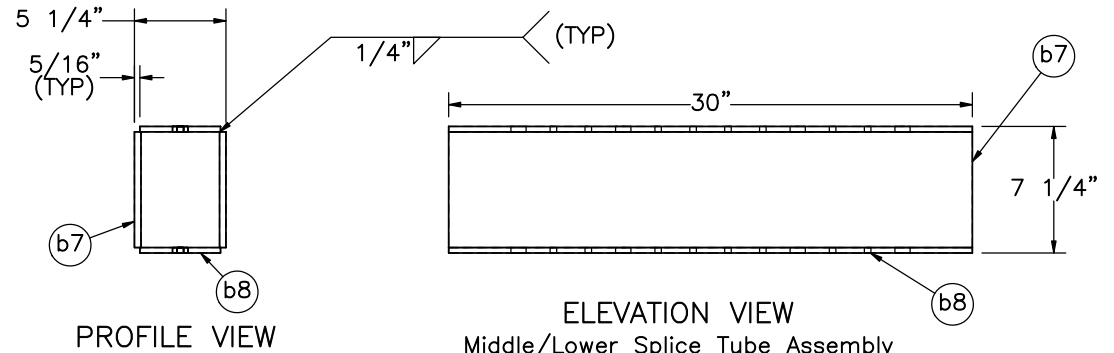
PLAN VIEW



ELEVATION VIEW
Part b8



ELEVATION VIEW
Middle/Lower Splice Tube Assembly

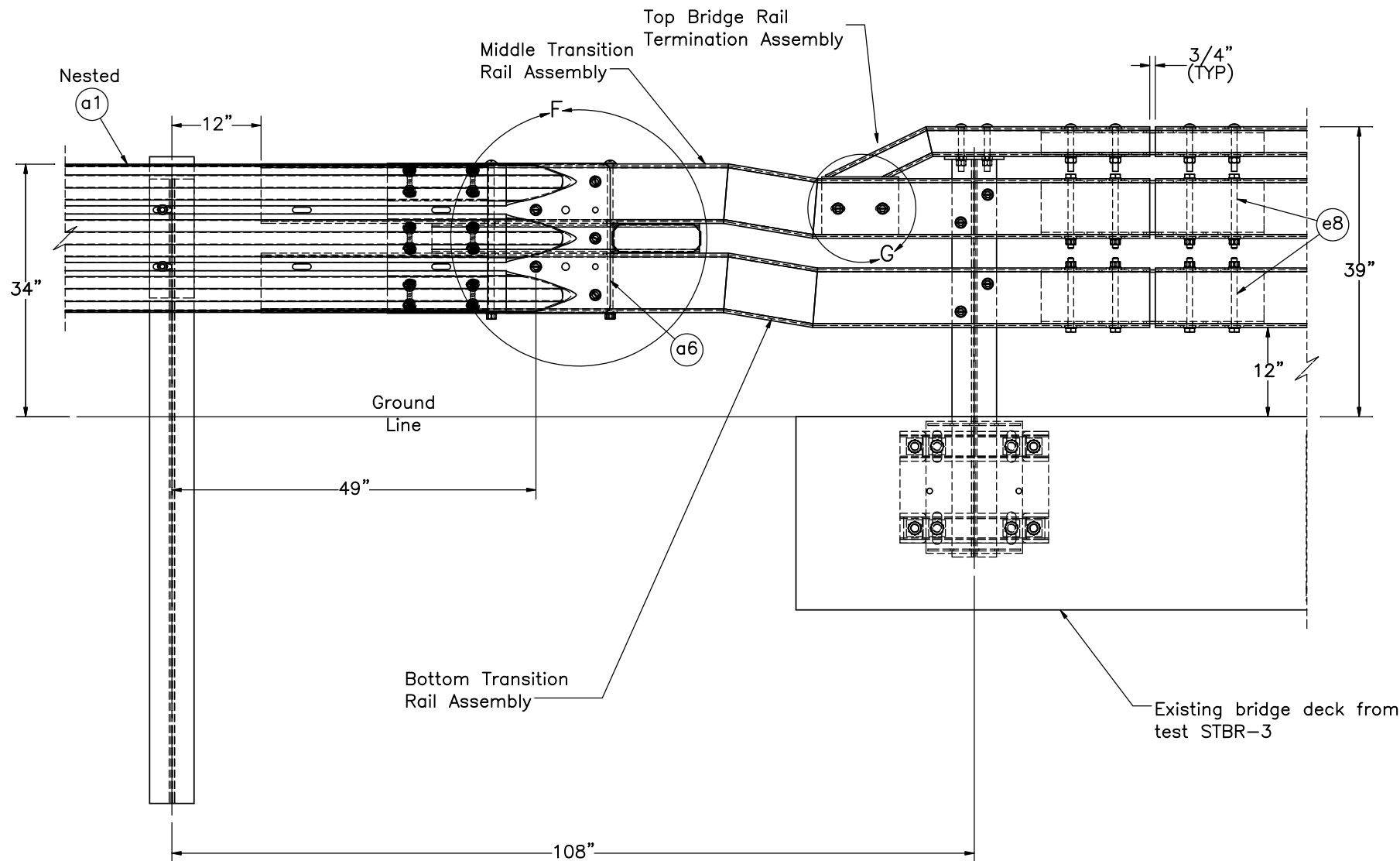


- Notes: (1) To help hold the shape of the splice assembly through the welding and galvanizing processes, it is recommended to use gussets or shim blocks.
(2) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	6	Middle/Lower Splice Tube Assembly – Option 1	—	ASTM A123
b7	2	30"x6 5/8"x3/8" Plate	ASTM A572 Gr. 50	See Assembly
b8	2	30"x4 5/8"x5/16" Plate	ASTM A572 Gr. 50	See Assembly



OH-IL Transition to MGS Guardrail Test Series STBRT		SHEET: 9 of 35
Middle/Lower Splice Tube Assembly		DATE: 1/12/2020
DWG. NAME: STBRT 1-2_R14		DRAWN BY: LJP/JRF/SBW
SCALE: 1:11		REV. BY: JEK/SKR/JDR
UNITS: in.		



- Notes: (1) Part a6 should be sandwiched between nested parts a1.
 (2) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

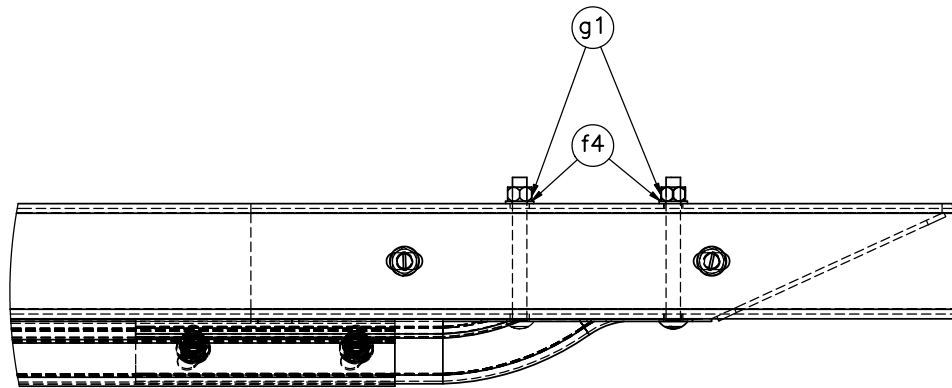
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Transition Layout

DWG. NAME:
STBRT 1-2_R14

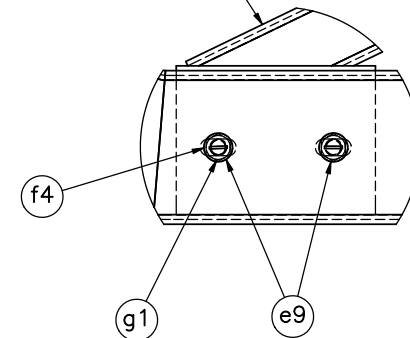
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UNITS: in.

SHEET:
10 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR

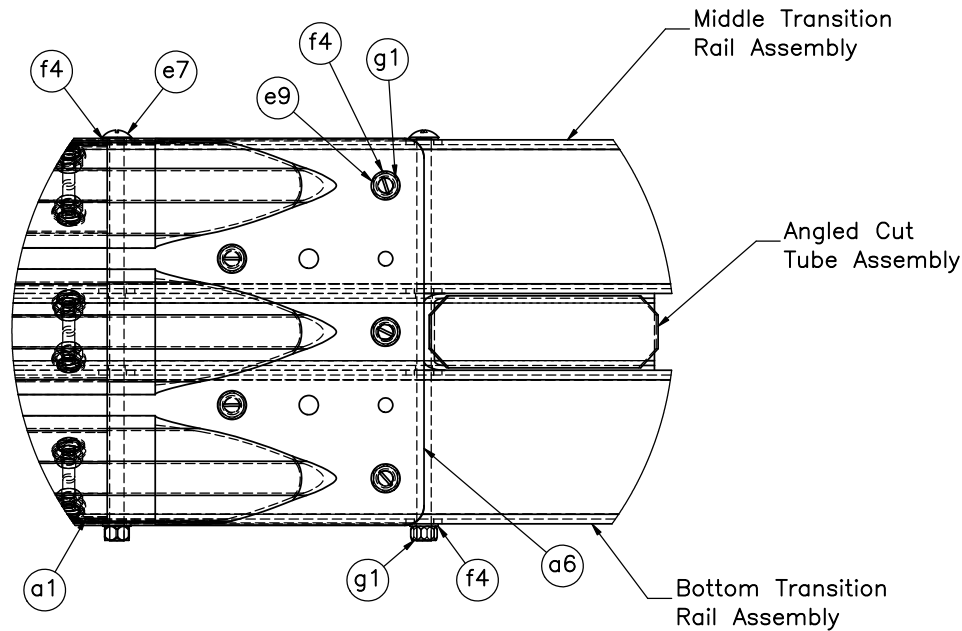


DETAIL E

Top Bridge Rail
Termination Assembly



DETAIL G



DETAIL F

Middle Transition
Rail Assembly

Angled Cut
Tube Assembly

Bottom Transition
Rail Assembly

- Notes: (1) Part a6 should be sandwiched between nested parts a1.
(2) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

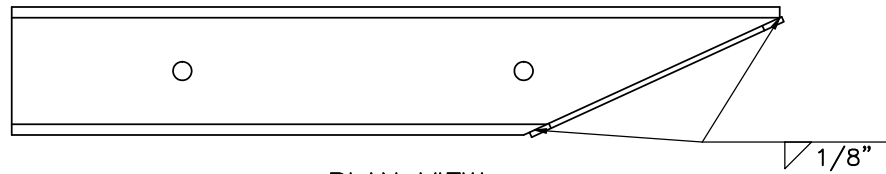
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Transition Details

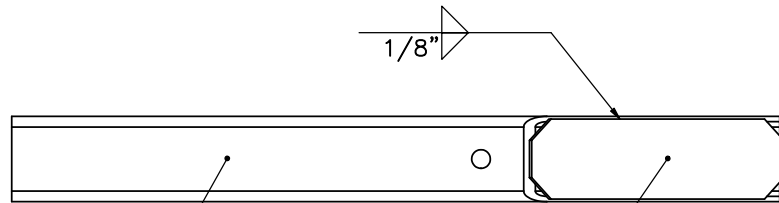
DWG. NAME.
STBRT 1-2_R14

SCALE: 1:10
UNITS: in.

SHEET:
11 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SB
W
REV. BY:
JEK/SKR/J
DR

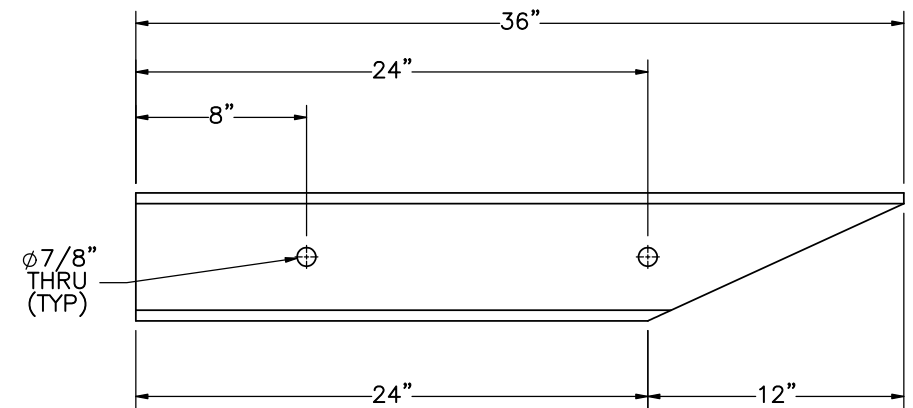


PLAN VIEW

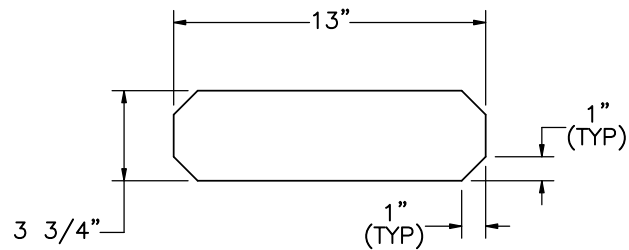


ELEVATION VIEW

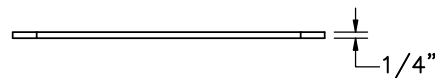
Angled Cut
Tube Assembly



PLAN VIEW

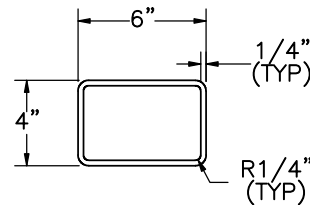


ELEVATION VIEW

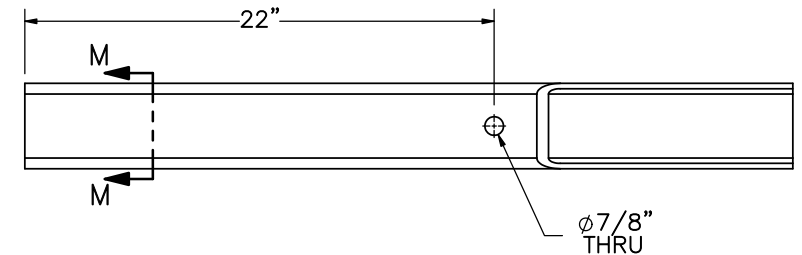


PLAN VIEW

Part h2



SECTION M-M



ELEVATION VIEW

Part h1

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	1	Angled Cut Tube Assembly	—	ASTM 123
h1	1	HSS 6"x4"x1/4", 36" Long Angled Cut Tube	ASTM A500 Gr. C	See Assembly
h2	1	13"x3 3/4"x1/4" Plate	ASTM A572 Gr. 50	See Assembly



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Angled Cut Tube Assembly

DWG. NAME:
STBRT 1-2_R14

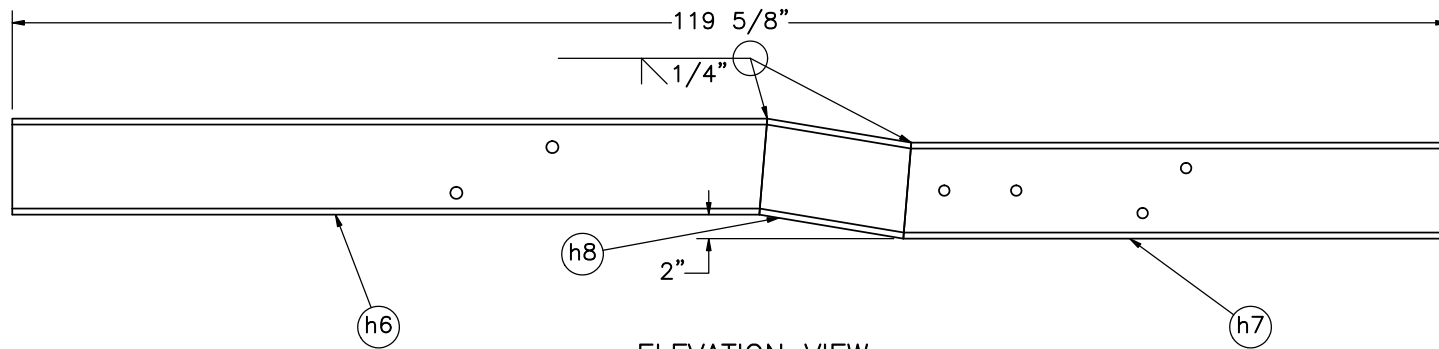
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UNITS: in.

SHEET:
12 of 35

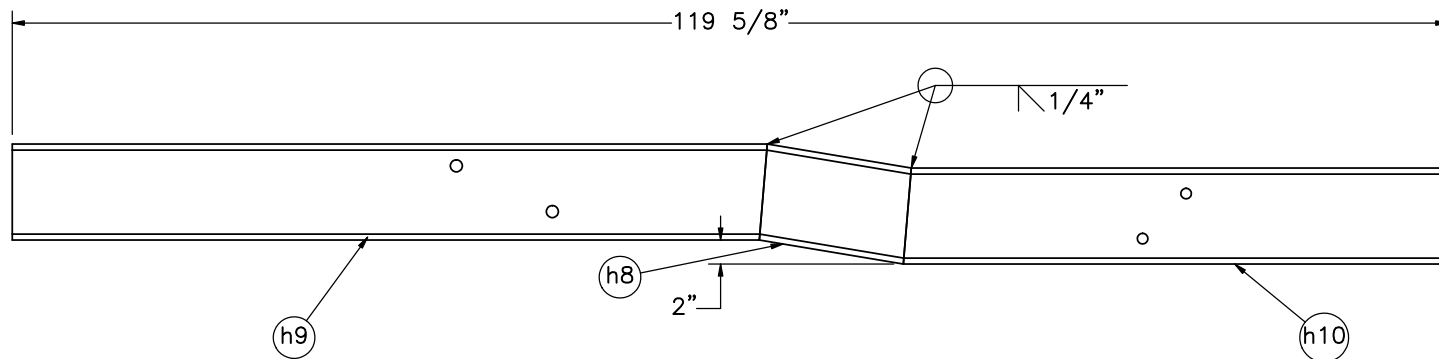
DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SBW

REV. BY:
JEK/SKR/JDR



ELEVATION VIEW
Middle Transition Rail Assembly



ELEVATION VIEW
Bottom Transition Rail Assembly

Item No.	QTY.	Description	Material Specification	Treatment Specification
—	1	Middle Transition Rail Assembly	ASTM A500 Gr. C	ASTM A123
h6	1	HSS 8"x6"x1/4", 62 15/16" Long Middle Transition Rail	ASTM A500 Gr. C	See Assembly
h7	1	HSS 8"x6"x1/4", 45 3/8" Long Middle Transition Rail	ASTM A500 Gr. C	See Assembly
h8	1	HSS 8"x6"x1/4", 12 7/8" Long Transition Rail	ASTM A500 Gr. C	See Assembly
Item No.	QTY.	Description	Material Specification	Treatment Specification
—	1	Bottom Transition Rail Assembly	ASTM A500 Gr. C	ASTM A123
h8	1	HSS 8"x6"x1/4", 12 7/8" Long Transition Rail	ASTM A500 Gr. C	See Assembly
h9	1	HSS 8"x6"x1/4", 62 15/16" Long Bottom Transition Rail	ASTM A500 Gr. C	See Assembly
h10	1	HSS 8"x6"x1/4", 45 3/8" Long Bottom Transition Rail	ASTM A500 Gr. C	See Assembly

- Notes: (1) Fabricator—Please provide opinion if the specified bevel welds will obtain full strength of the section or if an alternate weld would provide better strength. These will be critically loaded parts.
- (2) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

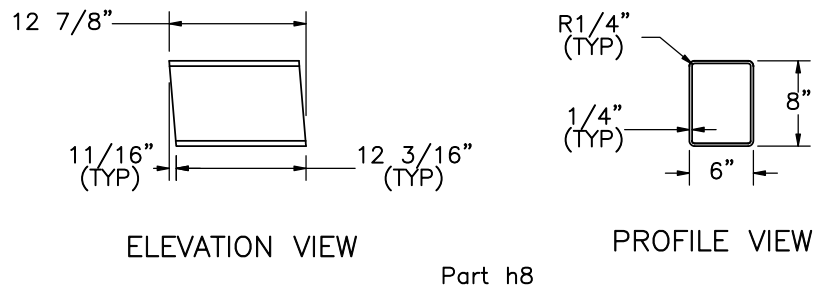
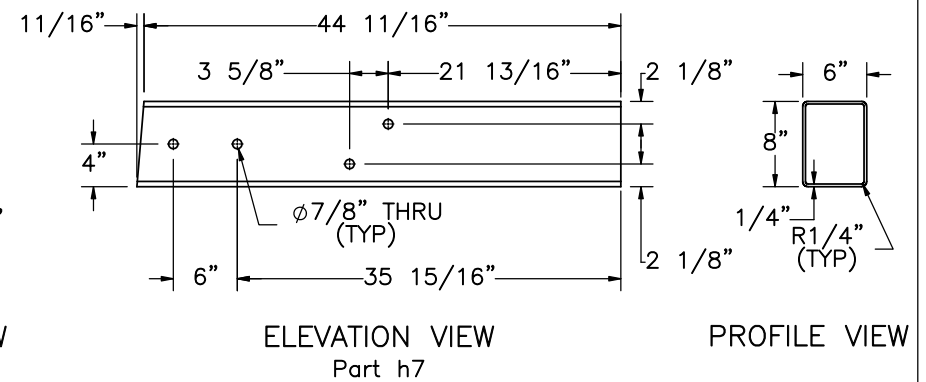
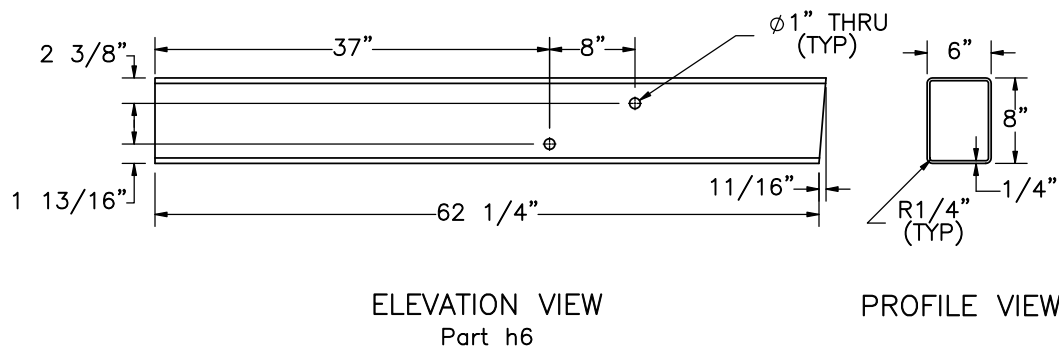
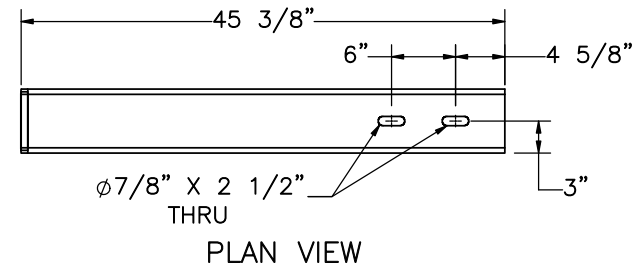
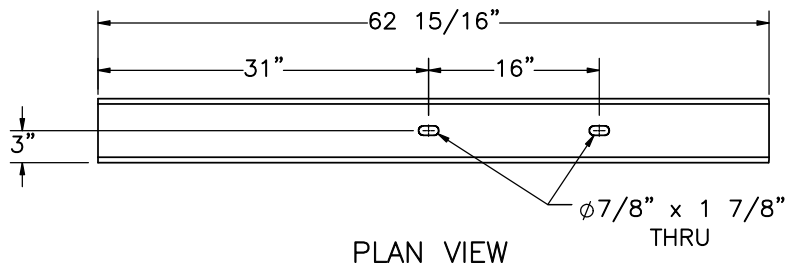
OH—IL Transition
to MGS Guardrail
Test Series STBRT

Middle/Bottom Transition Rail
Assemblies

DWG. NAME.
STBRT 1—2_R14

SCALE: 1:16
UNITS: in.

SHEET:
13 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR



Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Transition Rail Component
Details

DWG. NAME:
STBRT 1-2_R14

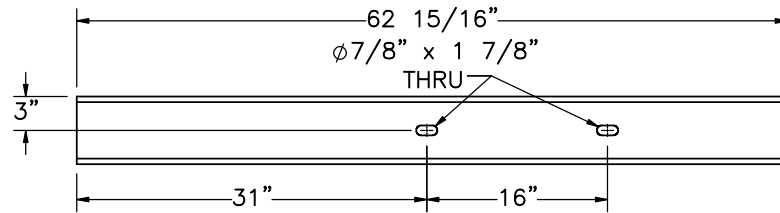
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SHEET:
14 of 35

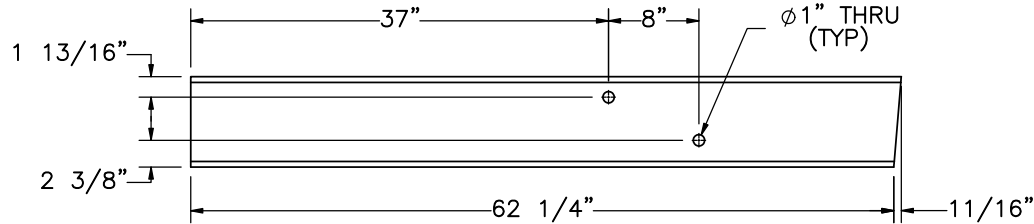
DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SB
W

REV. BY:
JEK/SKR/J
DR

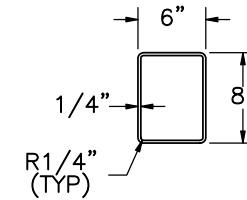


PLAN VIEW

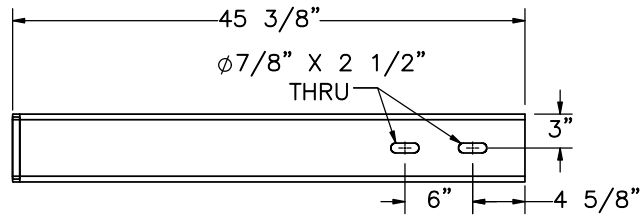


ELEVATION VIEW

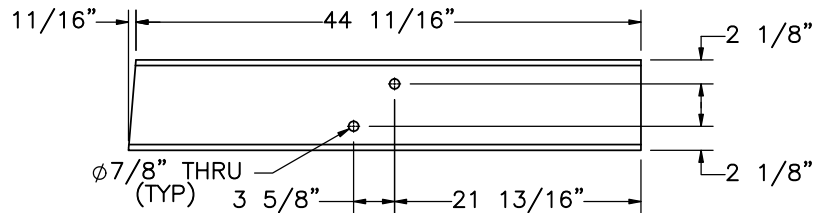
Part h9



PROFILE VIEW

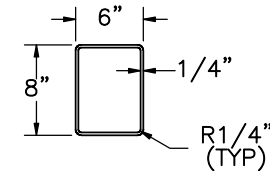


PLAN VIEW



ELEVATION VIEW

Part h10



PROFILE VIEW

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Transition Rail Component
Details

DWG. NAME:
STBRT 1-2_R14

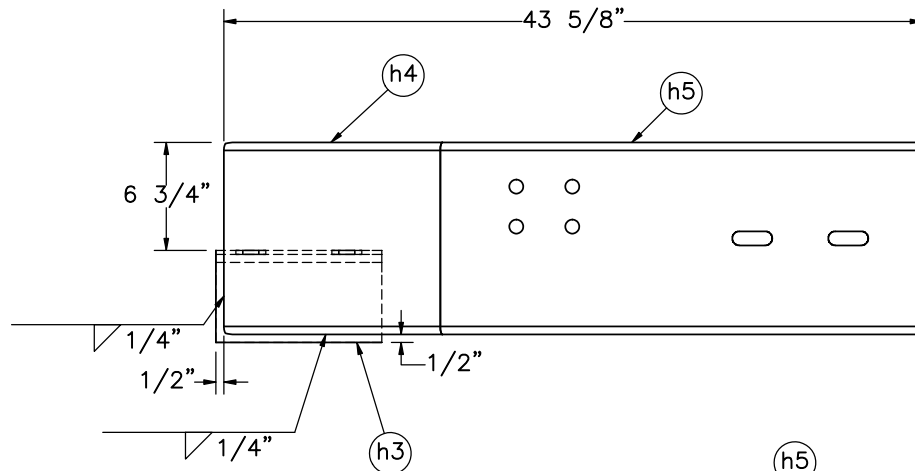
SCALE: 1:17
UNITS: in.

SHEET:
15 of 35

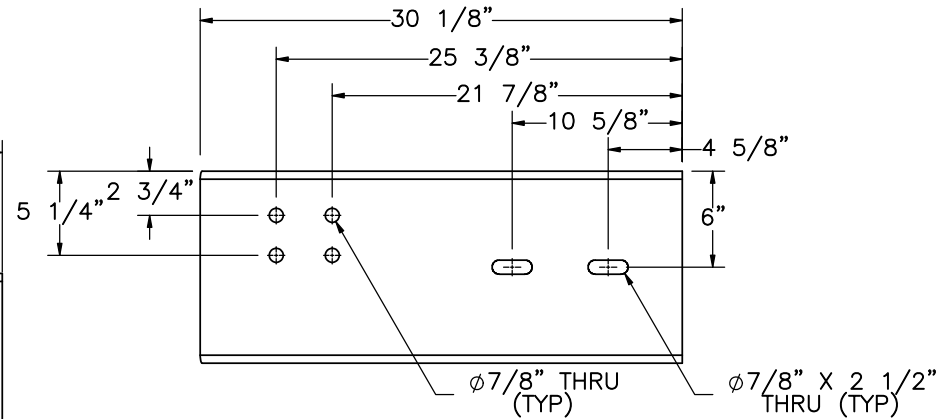
DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SBW

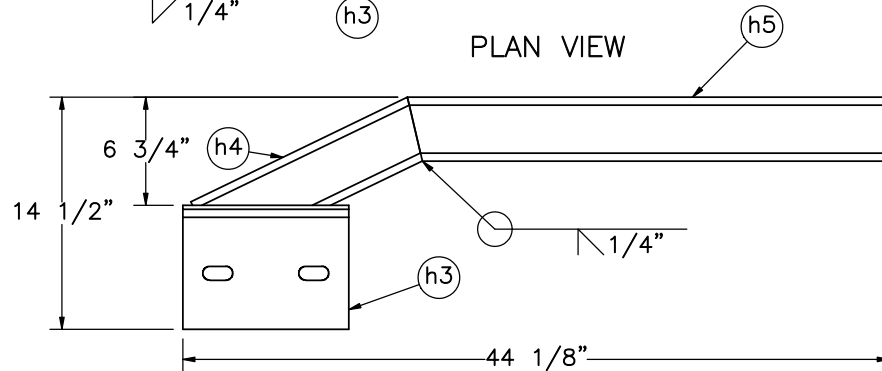
REV. BY:
JEK/SKR/JDR



PLAN VIEW

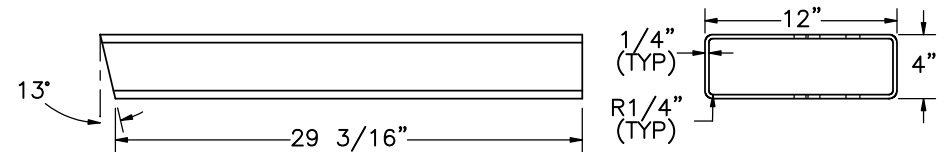


PLAN VIEW



ELEVATION VIEW

Top Bridge Rail Termination Assembly



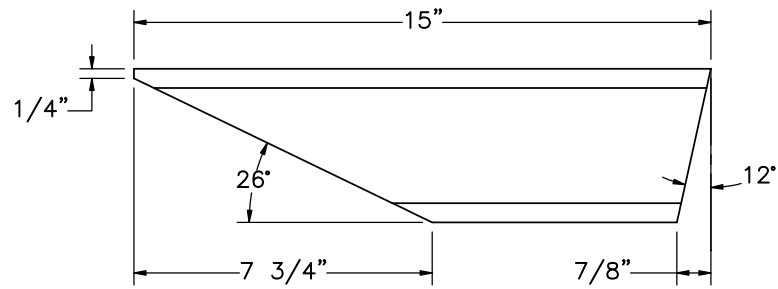
ELEVATION VIEW

PROFILE VIEW

Part h5

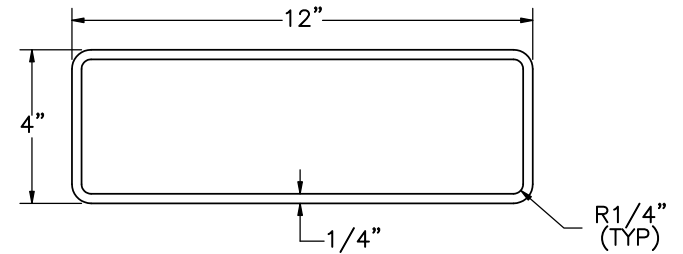
- Notes: (1) Fabricator—Please provide opinion if the specified bevel welds will obtain full strength of the section or if an alternate weld would provide better strength. These will be critically loaded parts.
- (2) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.

Item No.	QTY.	Description	Material Specification	Treatment Specification	 Midwest Roadside Safety Facility	OH-IL Transition to MGS Guardrail Test Series STBRT	Top Bridge Rail Termination Assembly DWG. NAME: STBRT 1-2_R14 SCALE: 1:12 UNITS: in.	SHEET: 16 of 35
—	1	Top Bridge Rail Termination Assembly	—	ASTM A123				DATE: 1/12/2020
h3	1	13"x10 3/8"x1/4" Bent Plate	ASTM A572 Gr. 50	See Assembly				DRAWN BY: LJP/JRF/SBW
h4	1	12"x4"x1/4", 15" Long Sloped Transition Rail	ASTM A500 Gr. C	See Assembly				REV. BY: JEK/SKR/JDR
h5	1	12"x4"x1/4", 30 1/8" Long Transition Rail	ASTM A500 Gr. C	See Assembly				

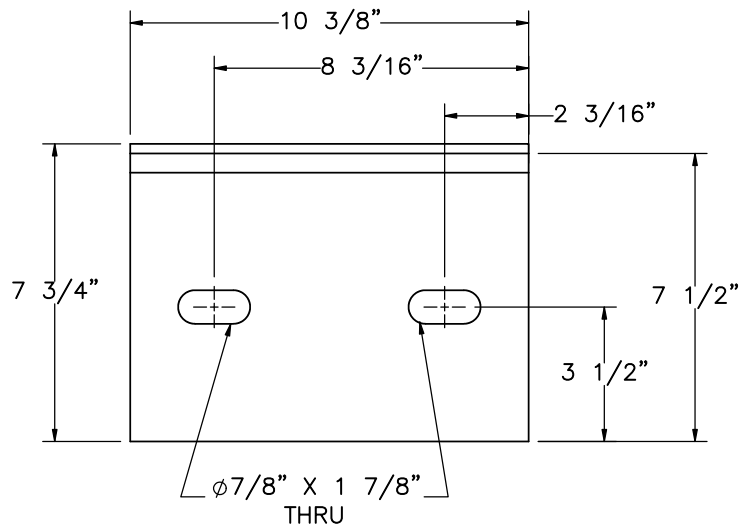


ELEVATION VIEW

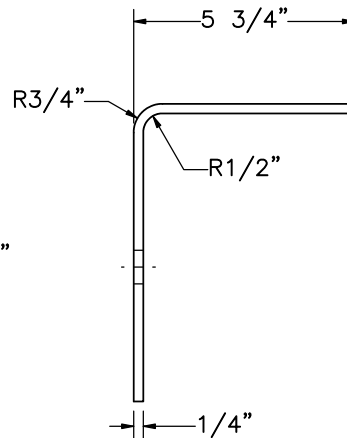
Part h4



PROFILE VIEW

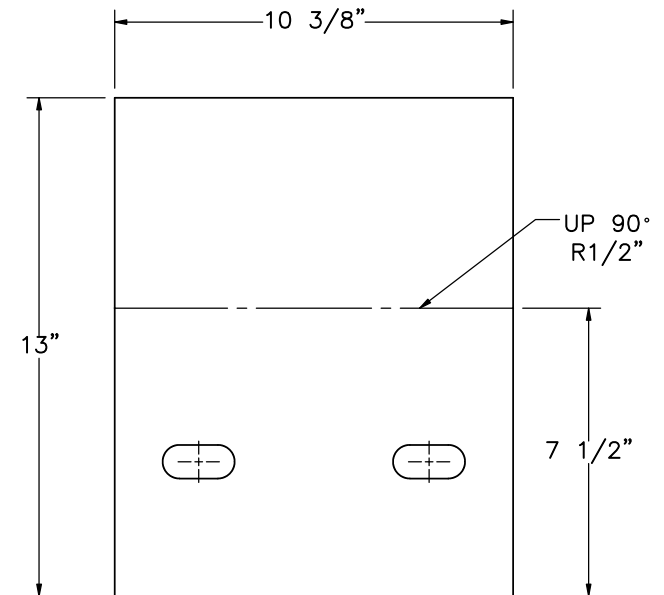


ELEVATION VIEW



PROFILE VIEW

Part h3



FLAT PATTERN

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Top Bridge Rail Termination
Pieces

DWG. NAME:
STBRT 1-2_R14

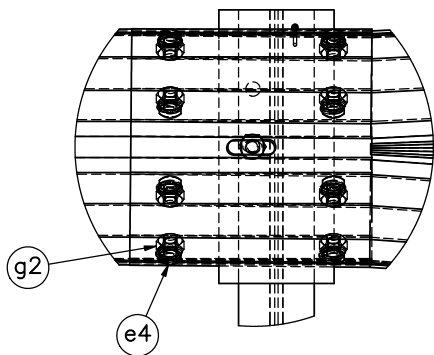
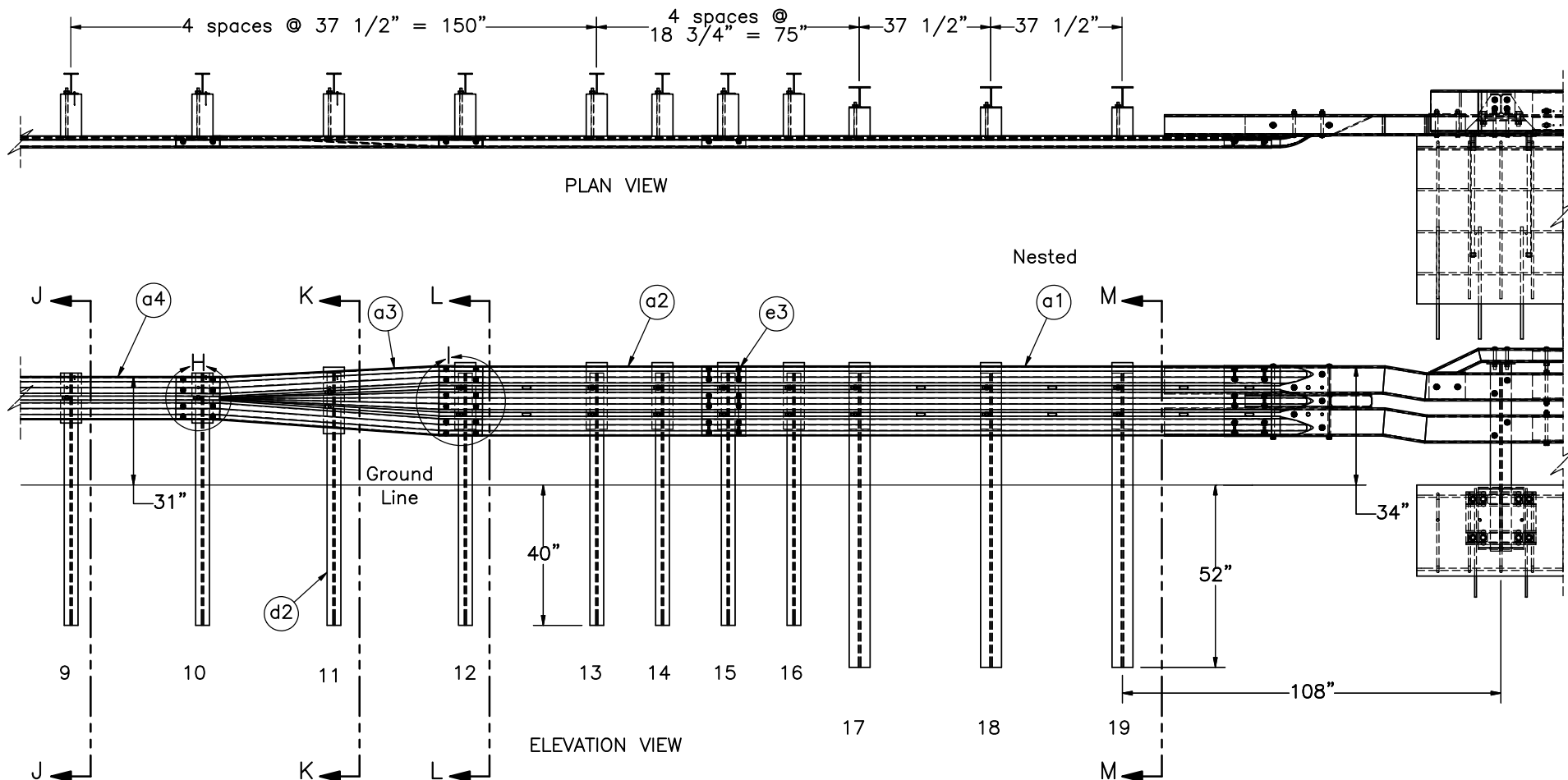
SCALE: 1:5
UNITS: in.

SHEET:
17 of 35

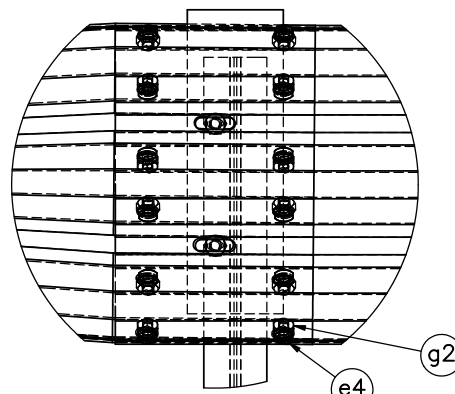
DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SB
W

REV. BY:
JEK/SKR/J
DR



DETAIL H
SCALE 1:10



DETAIL I
SCALE 1:12

- Note:
- (1) Part f3, 2" long guardrail bolts used at splice locations with nested thrie beam only
 - (2) The upstream end of part a3 is rotated upward 3/4" to accommodate the 31" MGS guardrail height.
 - (3) At post 11, only the top bolt should be installed.
 - (4) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

W-Beam to Thrie Beam
Transition

DWG. NAME:
STBRT 1-2_R14

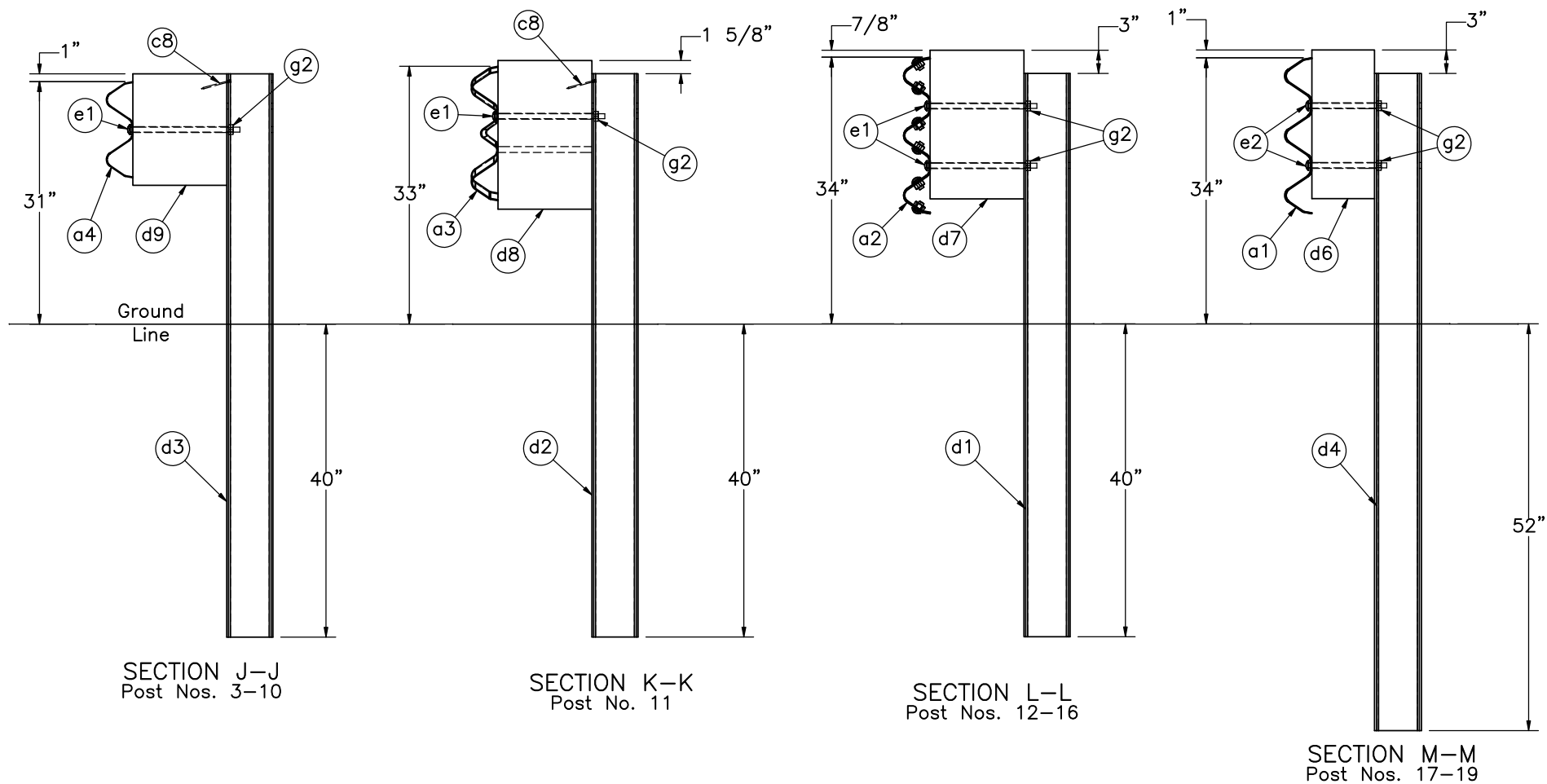
SCALE: 1:45
UNITS: in.

SHEET:
18 of 35

DATE:
1/23/2020

DRAWN BY:
LJP/JRF/SB
W

REV. BY:
JEK/SKR/J
DR



- Note: (1) AGT system may have routed blockouts or may use nails to prevent blockout rotation.
 (2) Only the top bolt is installed at Post no. 11.
 (3) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



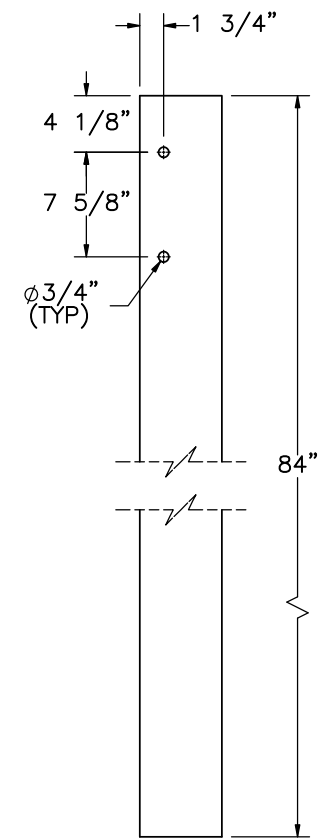
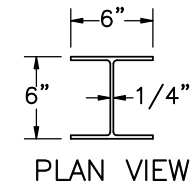
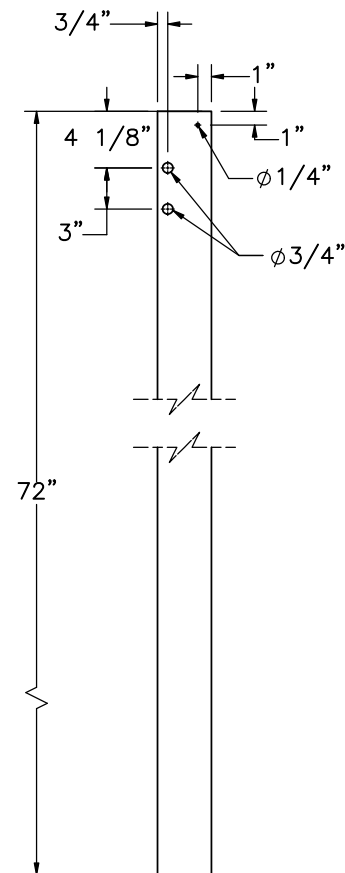
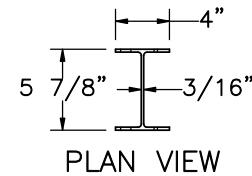
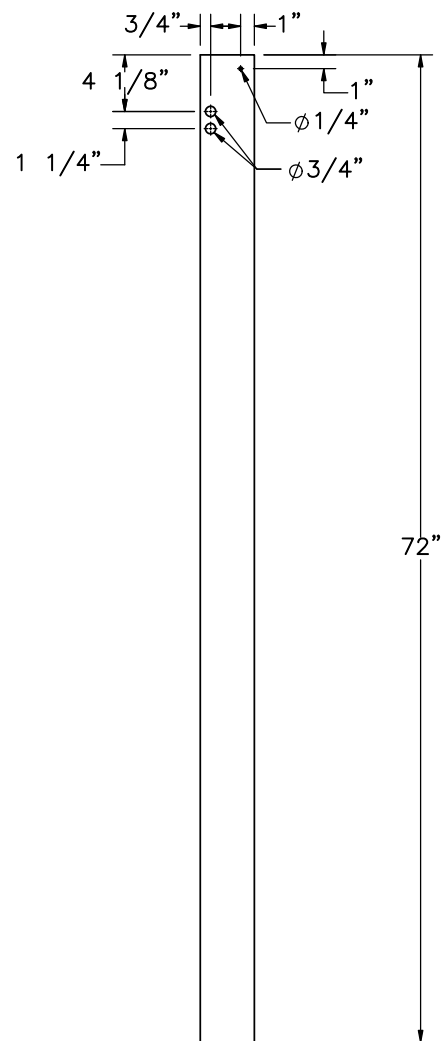
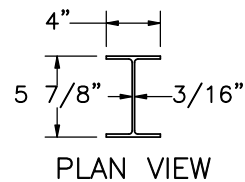
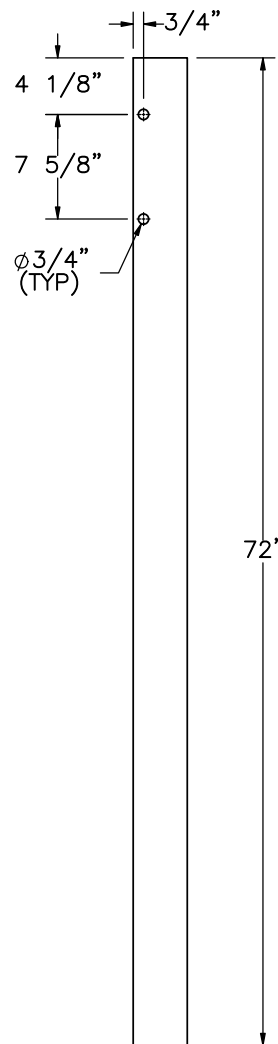
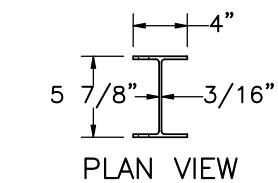
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Post Sections

DWG. NAME.
STBRT 1-2_R14

SCALE: 1:20
UNITS: in.

SHEET:
19 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR



Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

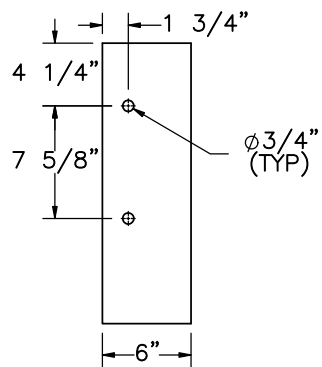
OH-IL Transition
to MGS Guardrail
Test Series STBRT

AGT Post Details

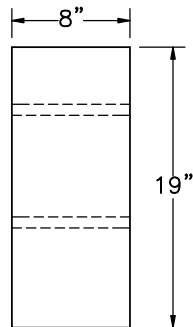
DWG. NAME.
STBRT 1-2_R14

SCALE: 1:14
UNITS: in.

SHEET:
20 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR

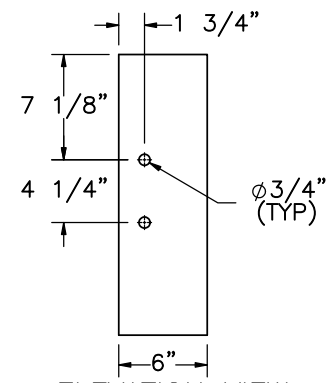


ELEVATION VIEW

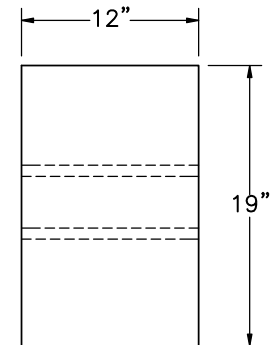


PROFILE VIEW

Part d6

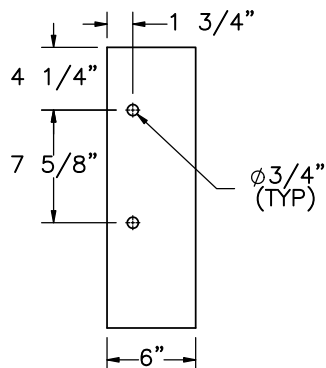


ELEVATION VIEW

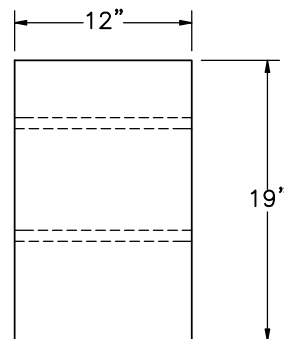


PROFILE VIEW

Part d8

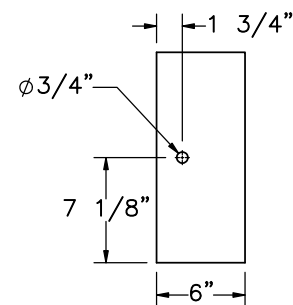


ELEVATION VIEW

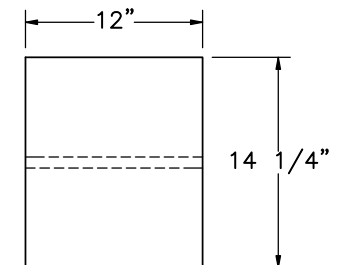


PROFILE VIEW

Part d7



ELEVATION VIEW



PROFILE VIEW

Part d9

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

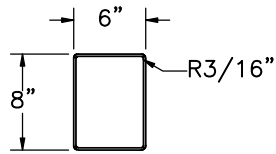
OH-IL Transition
to MGS Guardrail
Test Series STBRT

W-beam and thrie beam
blockouts

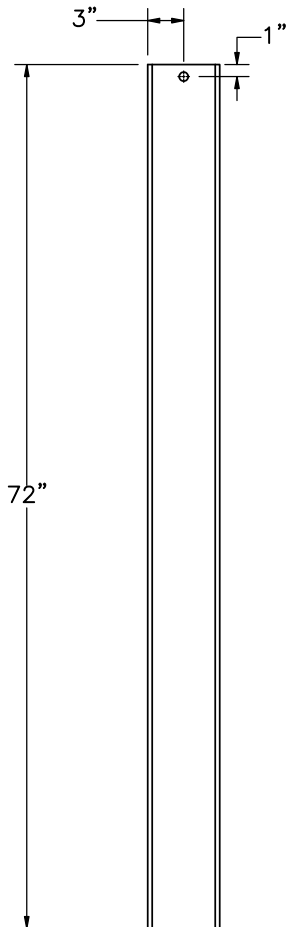
DWG. NAME:
STBRT 1-2_R14

SCALE: 1:13
UNITS: in.

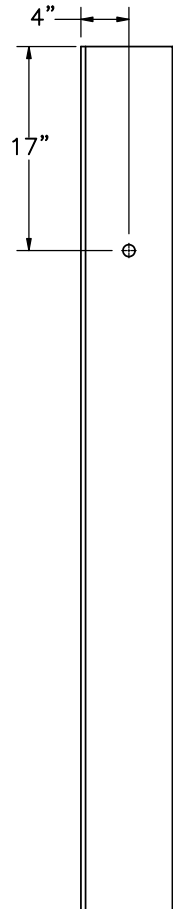
SHEET:
21 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SB
W
REV. BY:
JEK/SKR/J
DR



PLAN VIEW

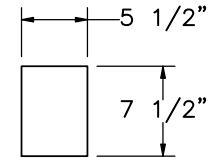


ELEVATION VIEW

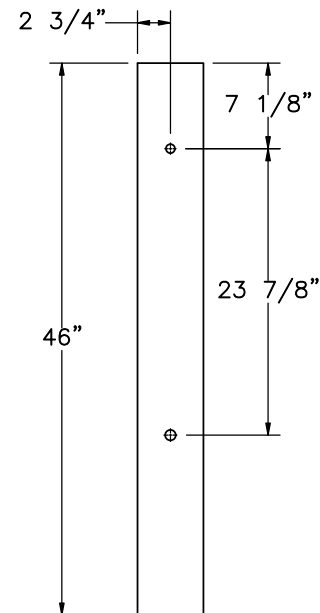


PROFILE VIEW

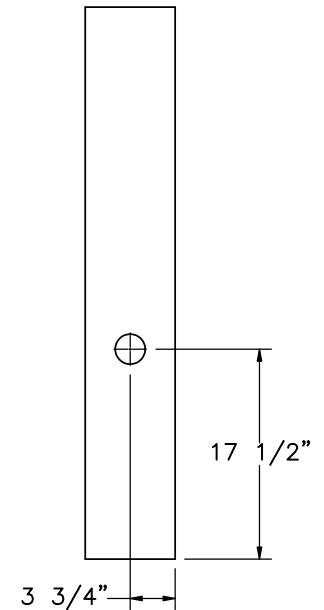
Part c2



PLAN VIEW



ELEVATION VIEW



PROFILE VIEW

Part c1

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

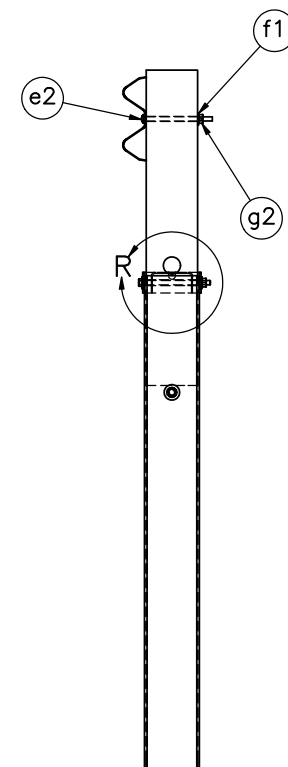
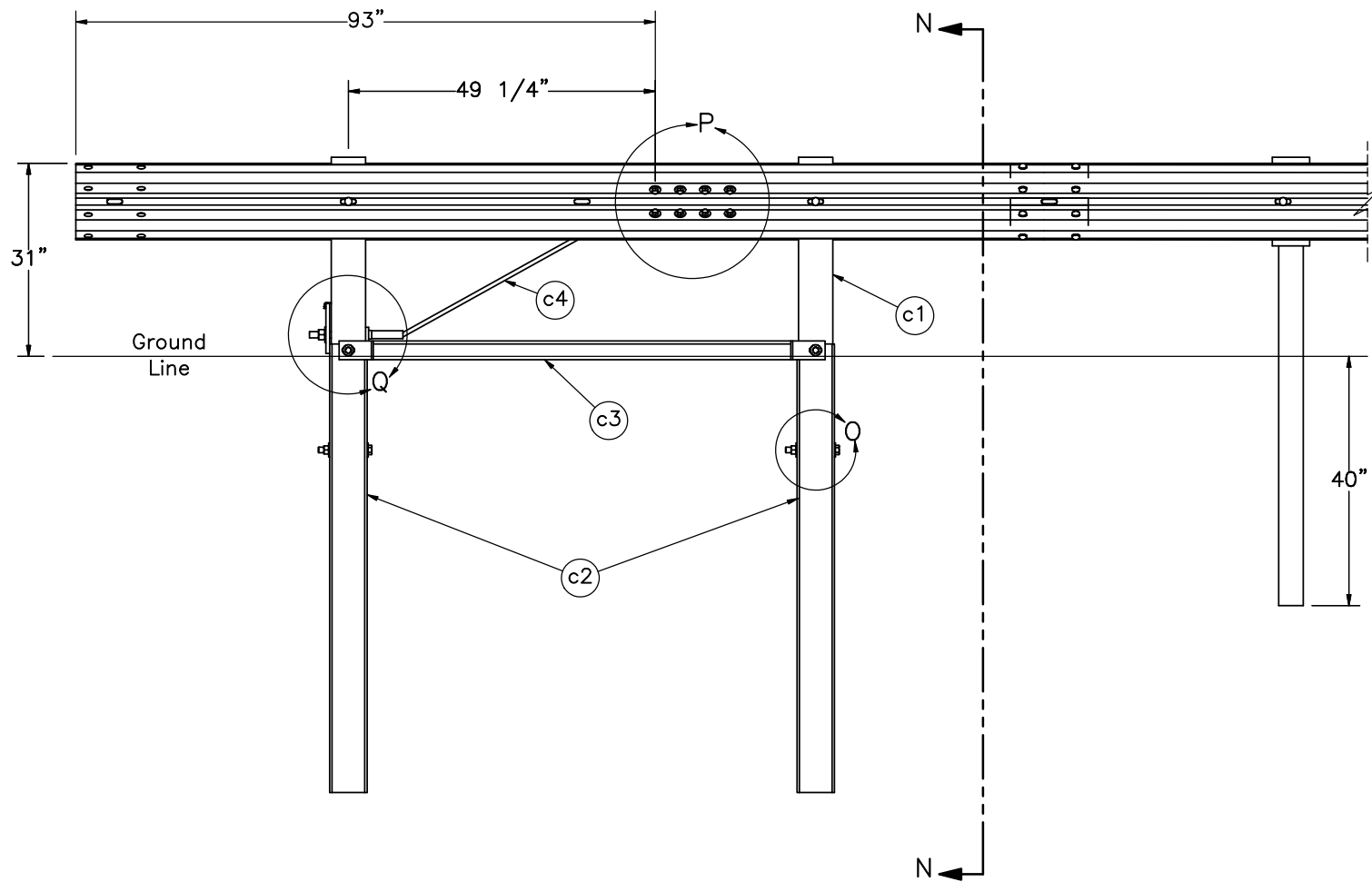
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Anchor Post Components

DWG. NAME.
STBRT 1-2_R14

SCALE: 1:16
UNITS: in.

SHEET:
22 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR



SECTION N-N

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

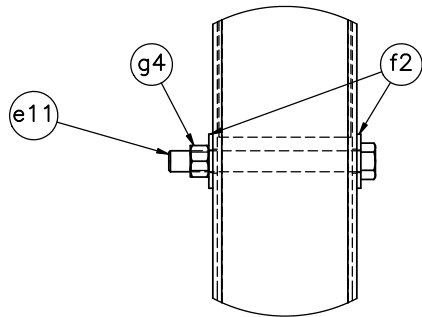
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Upstream Anchorage

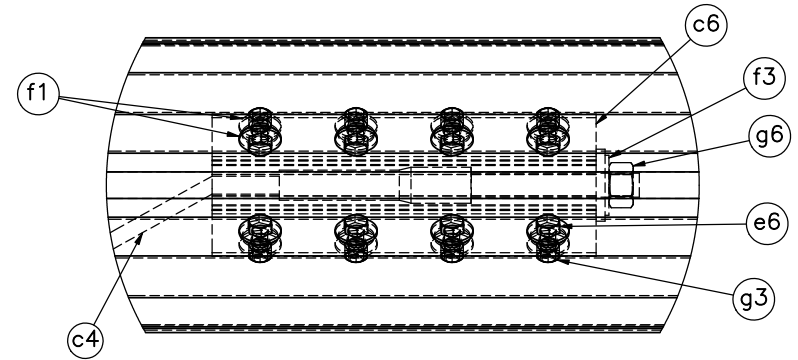
DWG. NAME.
STBRT 1-2_R14

SCALE: 1:28
UNITS: in.

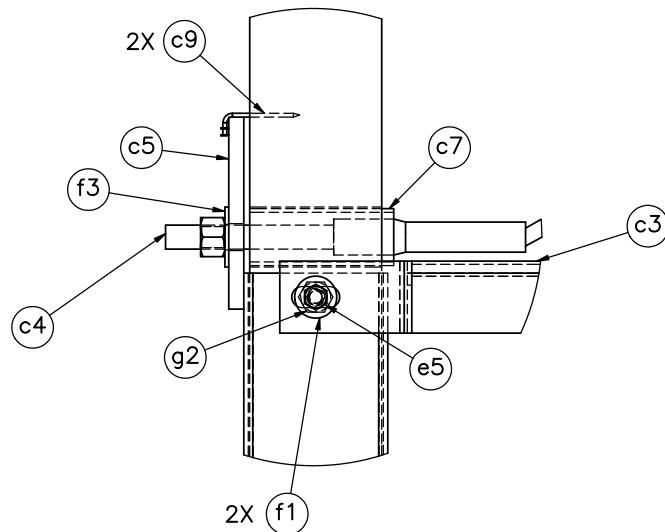
SHEET:
23 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR



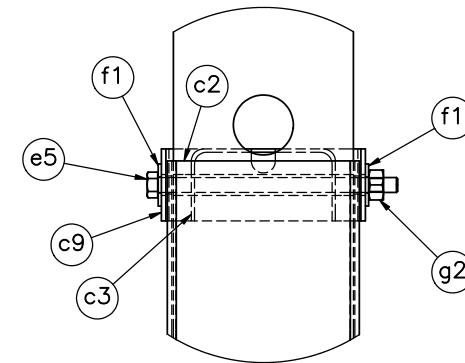
DETAIL O



DETAIL P



DETAIL Q



DETAIL R

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

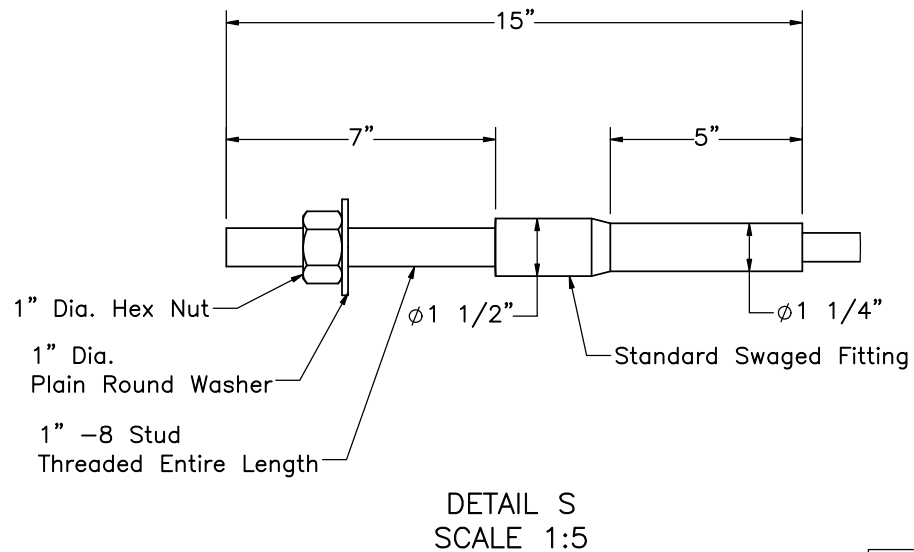
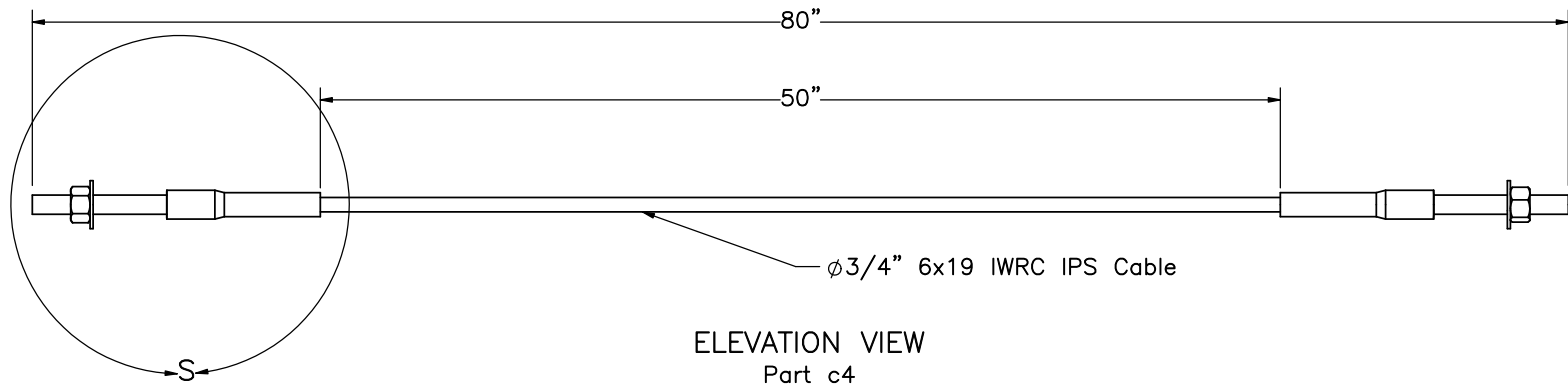
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Upstream Anchorage Details

DWG. NAME.
STBRT 1-2_R14

SCALE: 1:8
UNITS: in.

SHEET:
24 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SB
W
REV. BY:
JEK/SKR/J
DR



Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

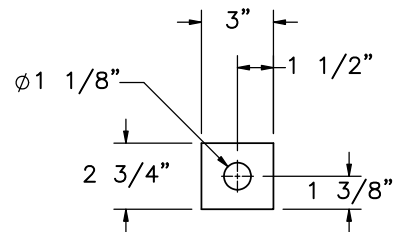
OH-IL Transition
to MGS Guardrail
Test Series STBRT

BCT Anchor Cable

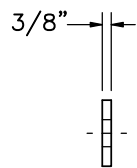
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STBRT 1-2_R14

SCALE: 1:10
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25 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR

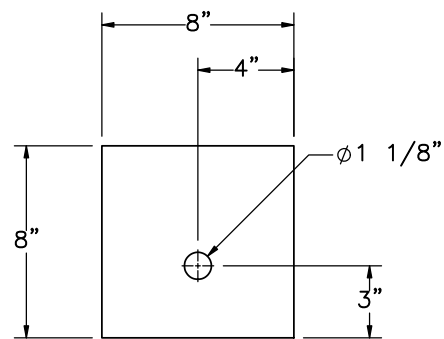


ELEVATION VIEW

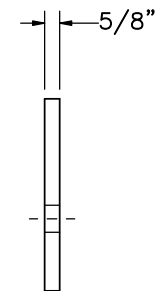


PROFILE VIEW

Anchor Bracket End Plate

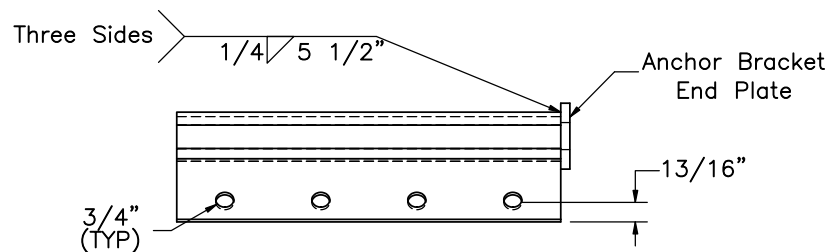


ELEVATION VIEW

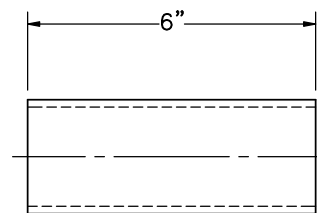


PROFILE VIEW

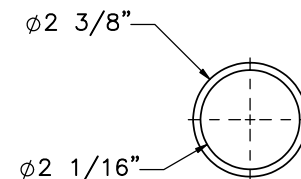
Part c5



PLAN VIEW

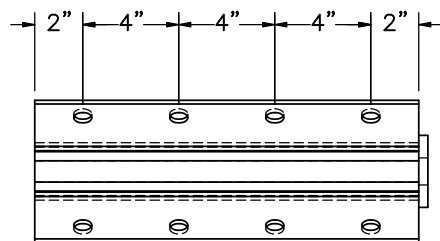


ELEVATION VIEW

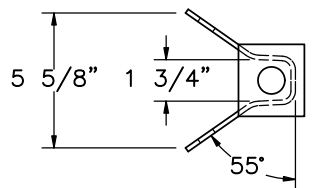


PROFILE VIEW

Part c7
SCALE 1:4



ELEVATION VIEW



PROFILE VIEW

Part c6

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

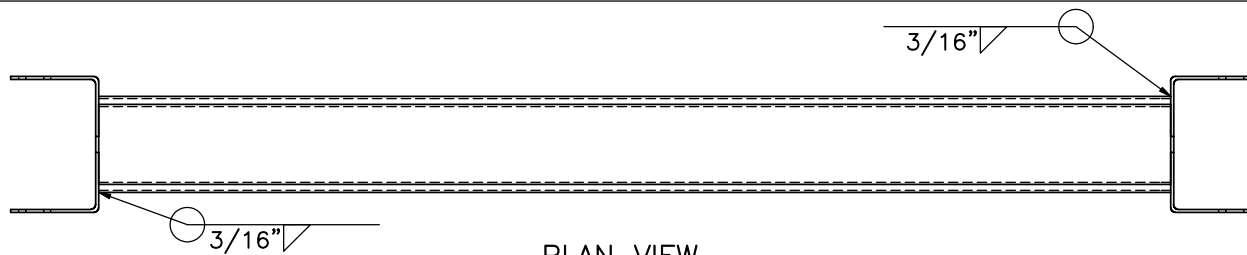
OH-IL Transition
to MGS Guardrail
Test Series STBRT

BCT Post Components &
Anchor Bracket

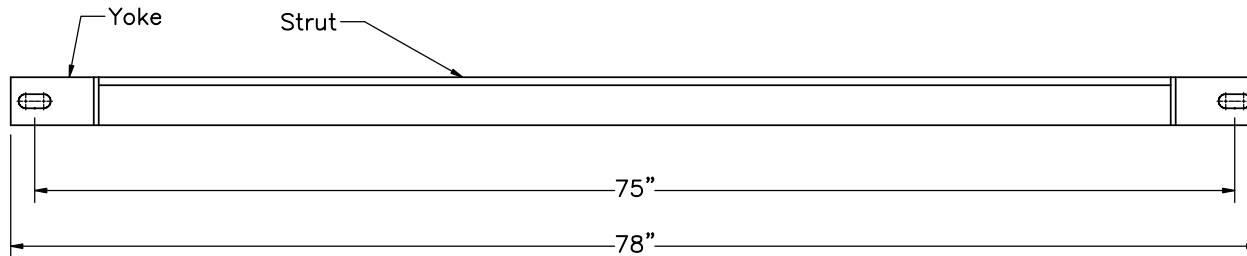
DWG. NAME:
STBRT 1-2_R14

SCALE: 1:8
UNITS: in.

SHEET:
26 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SBW
REV. BY:
JEK/SKR/JDR

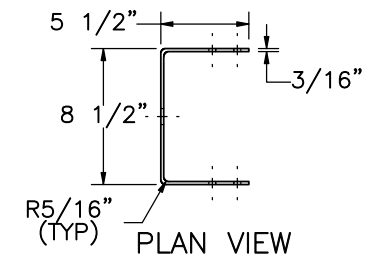


PLAN VIEW

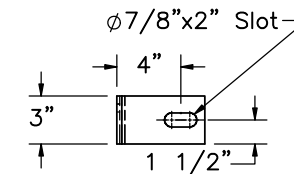


ELEVATION VIEW

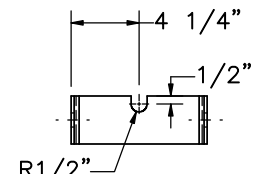
Part c3



PLAN VIEW

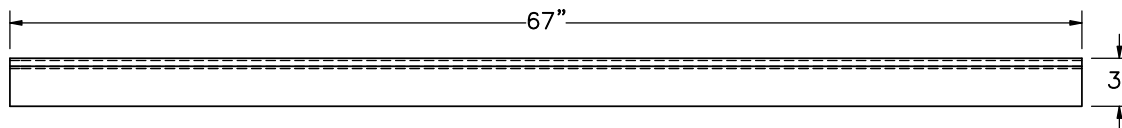


ELEVATION VIEW

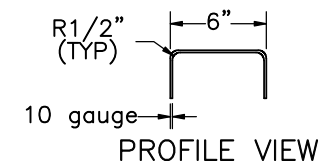


PROFILE VIEW

Yoke



ELEVATION VIEW



PROFILE VIEW

6"x3" 10 gauge strut

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Ground Strut Assembly

DWG. NAME.

STBRT 1-2_R14

SCALE: 1:12

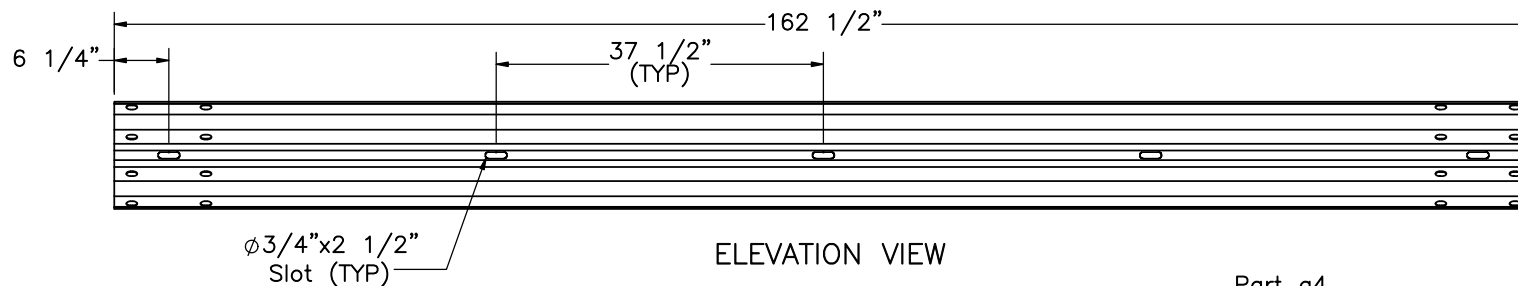
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SHEET:
27 of 35

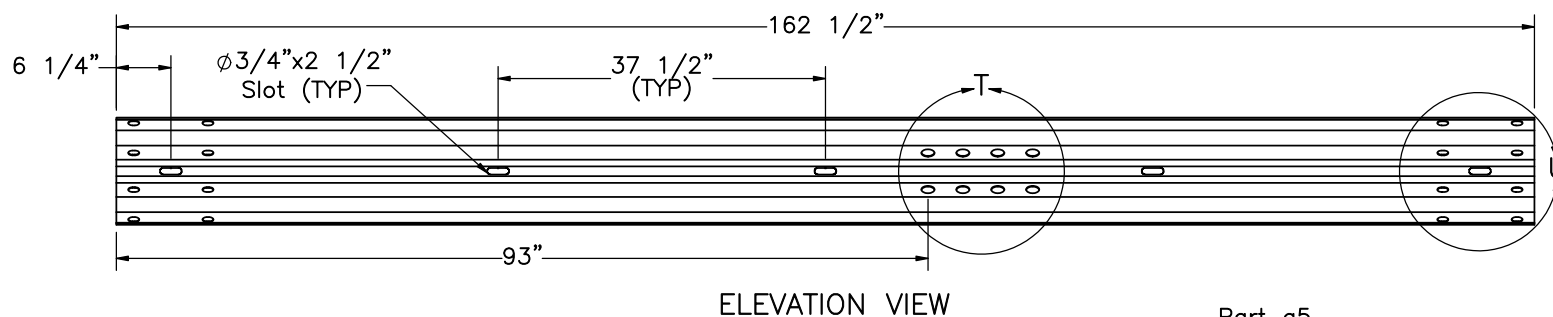
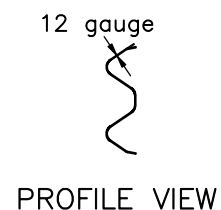
DATE:
1/12/2020

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LJP/JRF/SBW

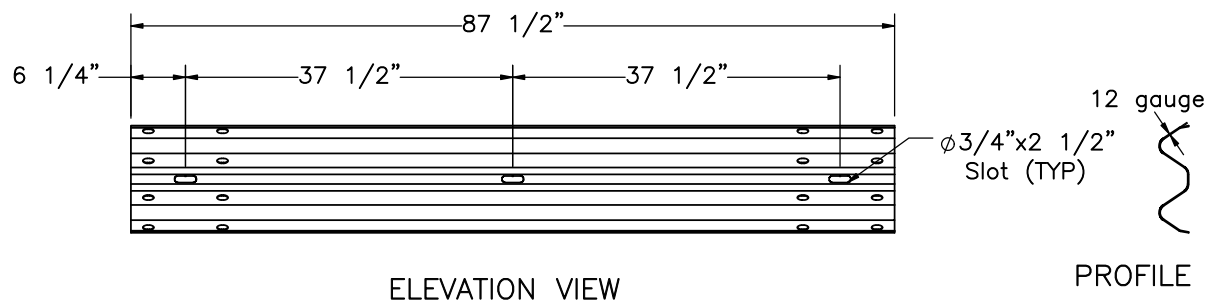
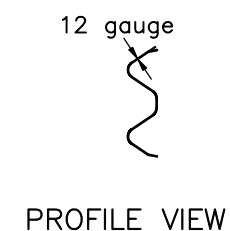
REV. BY:
JEK/SKR/JDR



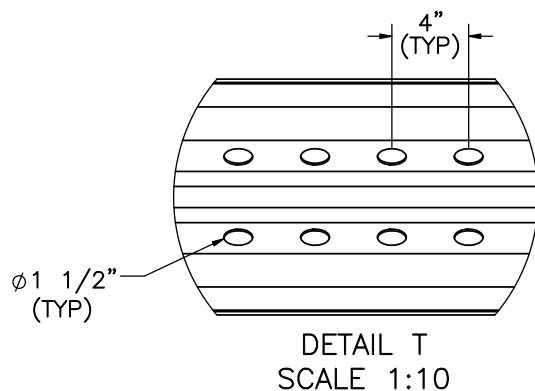
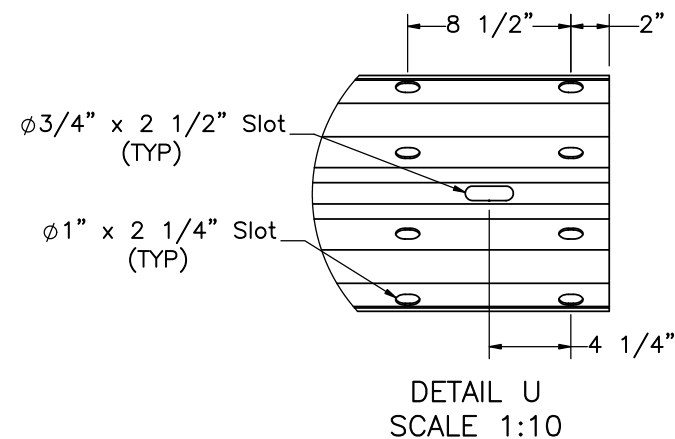
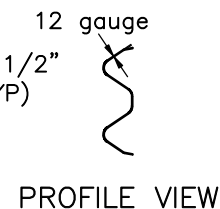
Part a4



Part a5



Part a7



Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

W-beam Rails

DWG. NAME.
STBRT 1-2_R14

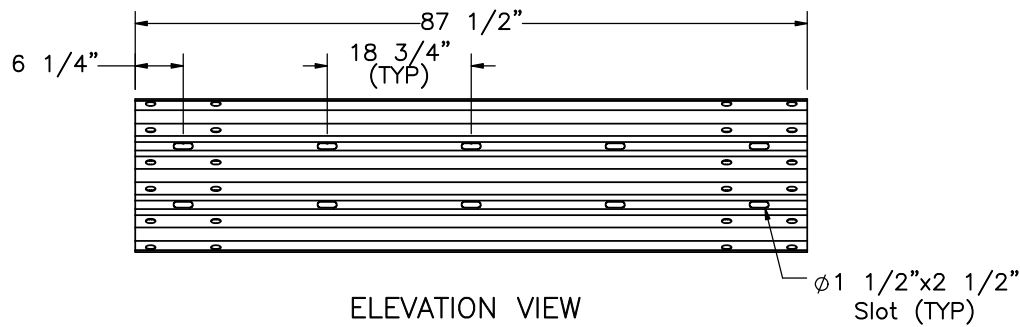
SCALE: 1:22
UNITS: in.

SHEET:
28 of 35

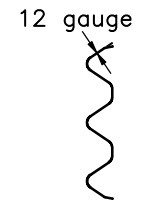
DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SB
W

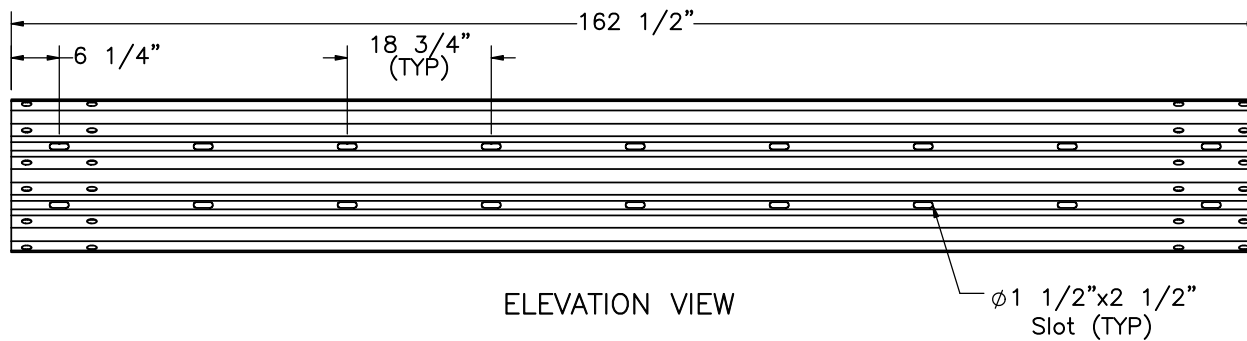
REV. BY:
JEK/SKR/J
DR



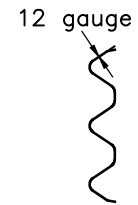
Part a2



PROFILE VIEW



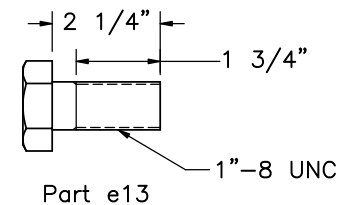
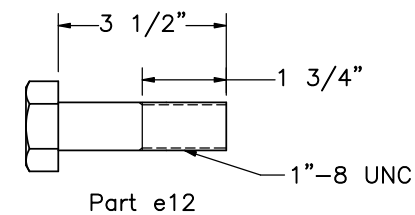
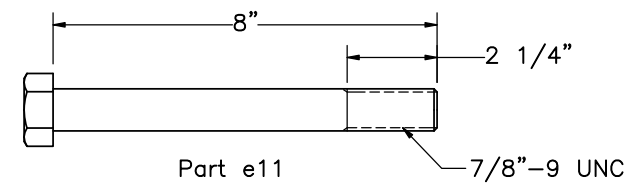
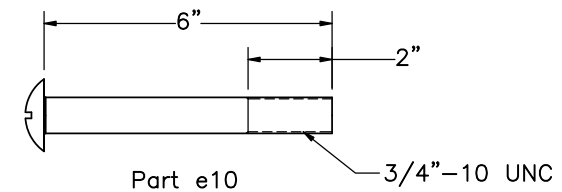
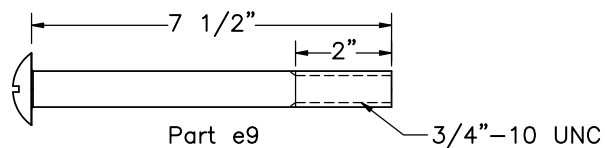
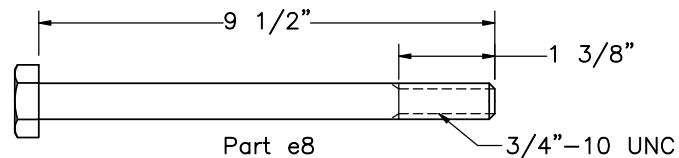
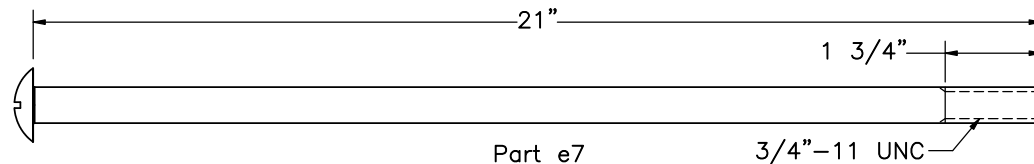
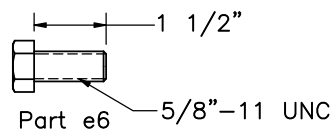
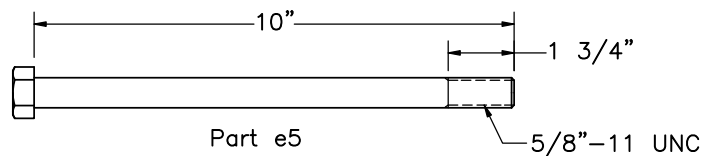
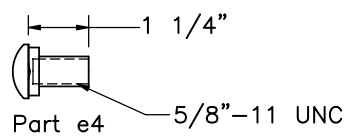
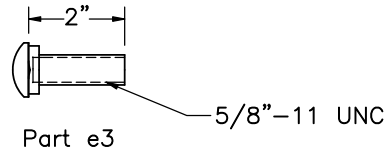
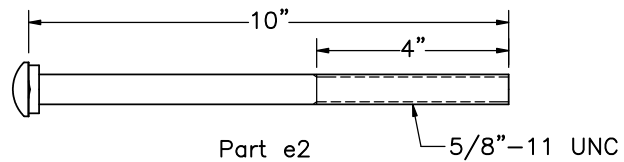
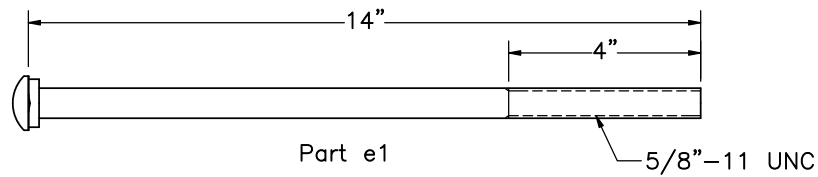
Part a1



PROFILE VIEW

Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.

	OH-IL Transition to MGS Guardrail Test Series STBRT		SHEET: 29 of 35
	Thrie Beam Rails		DATE: 1/12/2020
Midwest Roadside Safety Facility	DWG. NAME: STBRT 1-2_R14	SCALE: 1:25 UNITS: in.	DRAWN BY: LJP/JRF/SBW
			REV. BY: JEK/SKR/JDR



Notes: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

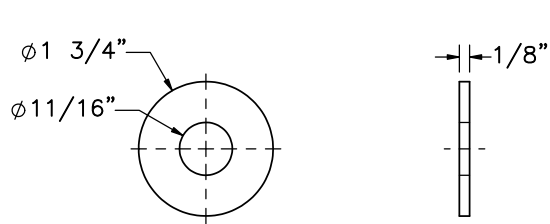
OH-IL Transition
to MGS Guardrail
Test Series STBRT

Hardware Details

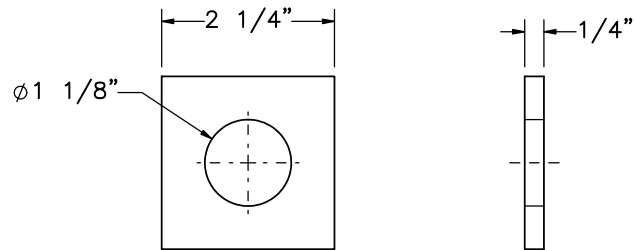
DWG. NAME.
STBRT 1-2_R14

SCALE: 1:4
UNITS: in.

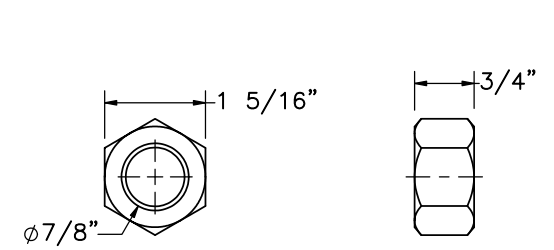
SHEET:
31 of 35
DATE:
1/12/2020
DRAWN BY:
LJP/JRF/SB
W
REV. BY:
JEK/SKR/J
DR



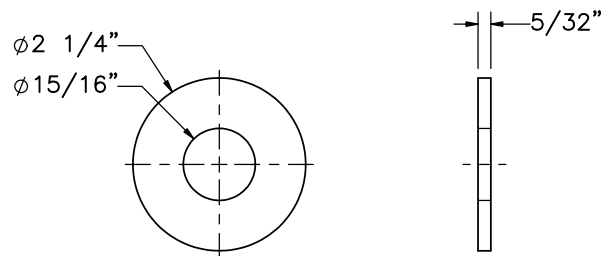
Part f1



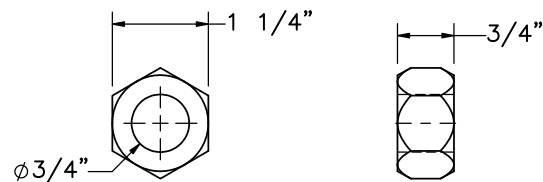
Part f5



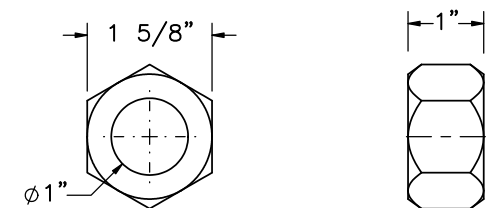
Part g4



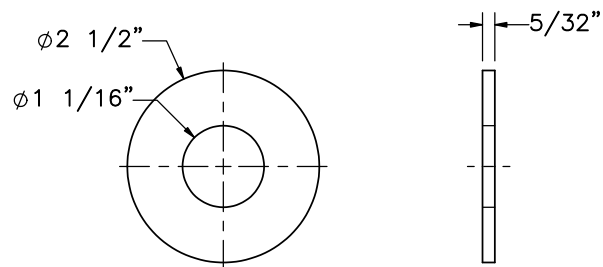
Part f2



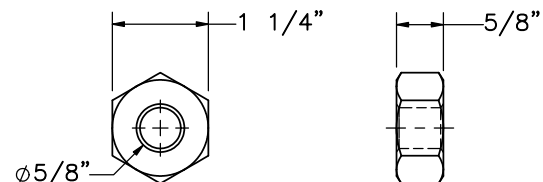
Part g1



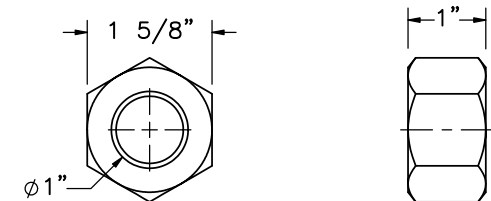
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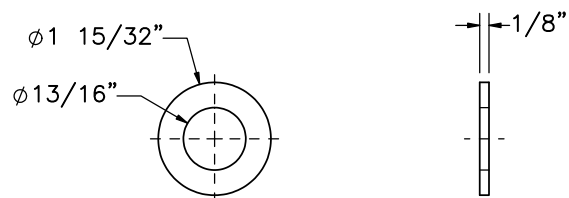
Part f3



Part g2



Part g6



Part f4

Note: (1) Material and treatment specifications for all parts are found in the Bill of Materials starting on sheet no. 33.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Hardware Details

DWG. NAME.
STBRT 1-2_R14

SCALE: 2:5
UNITS: in.

SHEET:
32 of 35
DATE:
1/12/2020
DRAWN BY:
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REV. BY:
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DR

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
—	—	MASH Strong Soil in Critical Region	—	—	—
—	—	Existing Bridge Deck	—	—	—
a1	24	12'-6" 12-gauge Thrie Beam Section	AASHTO M180	A123 or ASTM A653	RTM08a
a2	1	6'-3" 12-gauge Thrie Beam Section	AASHTO M180	A123 or ASTM A653	RTM19a
a3	1	10-gauge Symmetrical W-beam to Thrie Beam Transition	AASHTO M180	A123 or ASTM A653	RWT01b
a4	3	12'-6" 12-gauge W-Beam Section	AASHTO M180	A123 or ASTM A653	RWM04a
a5	1	12'-6" 12-gauge W-Beam MGS End Section	AASHTO M180	A123 or ASTM A653	RWM14a
a6	1	10-gauge Thrie Beam Terminal Connector	AASHTO M180 (Min yield strength = 50 ksi Min. ultimate strength = 70 ksi)	A123 or ASTM A653	RTE01b
a7	1	6'-3" 12-gauge W-Beam MGS Section	AASHTO M180	A123 or ASTM A653	RWM04a
b1	6	30"x10 5/8"x5/16" Plate	ASTM A572 Gr. 50	See Assembly	—
b2	6	30"x2 5/8"x3/8" Plate	ASTM A572 Gr. 50	See Assembly	—
b3	7	8"x8"x3/8" Plate	ASTM A572 Gr. 50	See Assembly	—
b4	7	17 3/4"x13"x1" Post Plate	ASTM A572 Gr. 50	See Assembly	—
b5	28	6 1/8"x5 11/16"x1/4" Gusset Plate	ASTM A572 Gr. 50	See Assembly	—
b6	14	HSS 5"x4"x1/2", 20" Long	ASTM A500 Gr. C	ASTM A123	—
b7	12	30"x6 5/8"x3/8" Plate	ASTM A572 Gr. 50	See Assembly	—
b8	12	30"x4 5/8"x5/16" Plate	ASTM A572 Gr. 50	See Assembly	—
b9	6	HSS 8"x6"x1/4", 191 1/4" Long	ASTM A500 Gr. C	ASTM A123	—
b10	3	HSS 12"x4"x1/4", 191 1/4" Long	ASTM A500 Gr. C	ASTM A123	—
b11	14	20"x15"x3/16" Steel Plate	ASTM A572 Gr. 50	See Assembly	—
c1	2	BCT Timber Post – MGS Height	SYP Grade No. 1 or better (No knots +/– 9" from weakening hole 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	8"x8"x5/8" Anchor Bearing Plate	ASTM A36	ASTM A123	FPB01
c6	1	Anchor Bracket Assembly	ASTM A36	ASTM A123	FPA01
c7	1	2 3/8" O.D. x 6" Long BCT Post Sleeve	ASTM A53 Gr. B Schedule 40	ASTM A123	FMM02

Note: (1) Quantities listed herein are only for one copy of the system.



Midwest Roadside
Safety Facility

OH-IL Transition
to MGS Guardrail
Test Series STBRT

Bill of Materials

DWG. NAME.
STBRT 1-2_R14

SCALE: None
UNITS: in.

SHEET:
33 of 35
DATE:
1/12/2020
DRAWN BY:
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W
REV. BY:
JEK/SKR/J
DR

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
c8	11	Bent 16D Double Head Nail	—	—	—
d1	5	W6x9 or W6x8.5, 72" Long Steel Post	ASTM A992	ASTM A123	—
d2	1	W6x9 or W6x8.5, 72" Long Steel Post	ASTM A992	ASTM A123	—
d3	8	W6x9 or W6x8.5, 72" Long Steel Post	ASTM A992	ASTM A123	—
d4	3	W6x15, 84" Long Steel Post	ASTM A992	ASTM A123	PWE12
d5	7	W6x15, 53 1/2" Long Post	ASTM A992	See Assembly	—
d6	3	6"x8"x19" Timber Blockout	SYP Grade No.1 or better	—	PDB17
d7	5	6"x12"x19" Timber Blockout	SYP Grade No.1 or better	—	—
d8	1	6"x12"x19" Timber Blockout	SYP Grade No.1 or better	—	PDB18
d9	8	6"x12"x14 1/4" Timber Blockout	SYP Grade No.1 or better	—	PDB10a
e1	19	5/8" Dia. UNC, 14" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F1941 or F2329	FBB06
e2	8	5/8" Dia. UNC, 10" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F1941 or F2329	FBB03
e3	24	5/8" Dia. UNC, 2" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F1941 or F2329	FBB02
e4	52	5/8" Dia. UNC, 1 1/4" Long Guardrail Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F1941 or F2329	FBB01
e5	2	5/8" Dia. UNC, 10" Long Hex Head Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F1941 or F2329	FBX16a
e6	8	5/8" Dia. UNC, 1 1/2" Long Hex Head Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F1941 or F2329	FBX16a
e7	2	3/4"—11 UNC, 21" Long Round Head Bolt	ASTM A449	ASTM A153 or B695 Class 55 or F1941 or F2329	FBB08
e8	24	3/4"—10 UNC, 9 1/2" Long Heavy Hex Head Bolt	ASTM F3125 Gr. A325 Type 1	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F1941 or F2329 or F2833 Gr. 1	FBX20b
e9	35	3/4"—10 UNC, 7 1/2" Long Round Head Bolt	ASTM A449	ASTM A153 or B695 Class 55 or F1941 or F2329	FBB08
e10	40	3/4"—10 UNC, 6" Long Round Head Bolt	ASTM A449	ASTM A153 or B695 Class 55 or F1941 or F2329	FBB08
e11	2	7/8" Dia. UNC, 8" Long Hex Head Bolt	ASTM A307 Gr. A	ASTM A153 or B695 Class 55 or F1941 or F2329	FBX22a
e12	28	1"—8 UNC, 3 1/2" Long Heavy Hex Head Bolt	ASTM F3125 Gr. A325 Type 1	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F1941 or F2329 or F2833 Gr. 1	FBX24b

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Midwest Roadside
Safety Facility

OH—IL Transition
to MGS Guardrail
Test Series STBRT

Bill of Materials

DWG. NAME:
STBRT 1—2_R14

SCALE: None
UNITS: in.

SHEET:
34 of 35

DATE:
1/12/2020

DRAWN BY:
LJP/JRF/SBW

REV. BY:
JEK/SKR/JDR

Item No.	QTY.	Description	Material Specification	Treatment Specification	Hardware Guide
e13	28	1"—8 UNC, 2 1/4" Long Heavy Hex Head Bolt	ASTM F3125 Gr. A325 Type 1	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F1941 or F2329 or F2833 Gr. 1	FBX24b
f1	34	5/8" Dia. SAE Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC16a
f2	4	7/8" Dia. USS Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	—
f3	2	1" Dia. USS Plain Round Washer	ASTM F844	ASTM A123 or A153 or F2329	FWC24a
f4	127	3/4" Dia. SAE Hardened Flat Washer	ASTM F436	ASTM A153 or B695 Class 55 or F1136 Gr. 3 or F2329	FWC20b
f5	84	2 1/4"x2 1/4"x1/4" Square Washer	ASTM A36	ASTM A123	—
g1	101	3/4 —10 UNC Heavy Hex Nut	ASTM A563DH	ASTM A153 or B695 Class 55 or F2329	FNX20b
g2	105	5/8" Dia. Guardrail Nut	ASTM A563A	ASTM A153 or B695 Class 55 or F2329	—
g3	8	5/8" Dia. Hex Nut	ASTM A563A	ASTM A153 or B695 Class 55 or F2329	FBX22a
g4	2	7/8" Dia. Hex Nut	ASTM A563A	ASTM A153 or B695 Class 55 or F2329	FBX22a
g5	56	1"—8 UNC Heavy Hex Nut	ASTM A563DH	ASTM A153 or B695 Class 55 or F2329	FNX24b
g6	2	1" Dia. Hex Nut	ASTM A563DH	ASTM A153 or B695 Class 55 or F2329	FBX24a
h1	1	HSS 6"x4"x1/4", 36" Long Angled Cut Tube	ASTM A500 Gr. C	See Assembly	—
h2	1	13"x3 3/4"x1/4" Plate	ASTM A572 Gr. 50	See Assembly	—
h3	1	13"x10 3/8"x1/4" Bent Plate	ASTM A572 Gr. 50	See Assembly	—
h4	1	12"x4"x1/4", 15" Long Sloped Transition Rail	ASTM A500 Gr. C	See Assembly	—
h5	1	12"x4"x1/4", 30 1/8" Long Transition Rail	ASTM A500 Gr. C	See Assembly	—
h6	1	HSS 8"x6"x1/4", 62 15/16" Long Middle Transition Rail	ASTM A500 Gr. C	See Assembly	—
h7	1	HSS 8"x6"x1/4", 45 3/8" Long Middle Transition Rail	ASTM A500 Gr. C	See Assembly	—
h8	2	HSS 8"x6"x1/4", 12 7/8" Long Transition Rail	ASTM A500 Gr. C	See Assembly	—
h9	1	HSS 8"x6"x1/4", 62 15/16" Long Bottom Transition Rail	ASTM A500 Gr. C	See Assembly	—
h10	1	HSS 8"x6"x1/4", 45 3/8" Long Bottom Transition Rail	ASTM A500 Gr. C	See Assembly	—

Note: (1) Quantities listed herein are only for one copy of the system.



Midwest Roadside
Safety Facility

OH—IL Transition
to MGS Guardrail
Test Series STBRT

Bill of Materials

DWG. NAME.
STBRT 1—2_R14

SCALE: None
UNITS: in.

SHEET:
35 of 35
DATE:
1/12/2020
DRAWN BY:
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W
REV. BY:
JEK/SKR/J
DR

REV.	DATE OF ISSUE	Page	NATURE OF CHANGES	REVIEWER	REVISED BY
0	1/30/2020	—	—	—	LJP
1	2/25/2020	—	Edited title lines. Pages 3 and 21 from the previous revision were removed. Added concrete slab to applicable drawings. Transition rails were changed from one part to assemblies with three different parts. Added 5/8" x 22" long bolts and nuts/washers to transition.	JEK/JDR	LJP
		1	Edited dimensions and notes. Added impact point dimension. Added notes 3, 4, 5, and 6. Removed section line F-F.		
		2	Adjusted part balloons. Moved section D-D and detail E to new page 3. Added note on blockout options.		
		3	New sheet showing bridge rail post details.		
		4	Added section F-F. Removed plan view. Edited dimensions		
		5	Added detail J. Added anti-rotation nails.		
		6	Added assembly names. Fixed dimensions. Added notes.		
		7	Added assembly names and part balloons showing 5/8" x 22" long bolts.		
		8	Edited dimensions. Added post numbers. Changed from crop view to break view.		
		9	Added plan view of assembly. Added assembly BOM. Added and edited weld notes.		
		10	Changed to show transition rail assemblies. Added assembly BOM's.		
		11	New page to show transition rail components		
		12	New page to show transition rail components		
		13	Added dimensions. Added assembly BOM.		
		14	Added dimensions. Added flat pattern.		
		15	Changed assembly QTY		
		18	Changed assembly QTY		
		20	Changed assembly QTY		
		22	Flipped rails 180 degrees.		
		HW1	Reordered bolts. Added 5/8" x 22" long bolts.		
		HW2	Added centerlines. Deleted original part h4, replaced with 5/8" nuts used in transition. Edited dimension lines.		

2	3/2/2020	1	Edited Impact Note, and general note. Changed font size for dimensions throughout document.	JEK	JRF/LJP
		2	Added part balloons and showed top bolt for section C-C. Changed font for notes following Section note.		
		3	Added note for post assembly, and changed transparency of concrete slab. Edited detail view scale note		
		4	Edited dimension		
		5	Edited part balloons		
		6	Added page and part views		
		7	Added page and part views		
		8	Added part balloons and created detail views P and Q		
		9	Changed transparency of concrete slab		
		10	Changed Assembly note and moved part balloons		
		11	Edited weld notes and Assembly notes. Changed font size for Part notes. Edited dimension notes. Edited descriptions and treatment specs on assembly bill of materials		
		12	Changed font size on assembly notes, and changed title block		
		13	Added profile view for Parts i6 and i7. Removed note (1). Moved part i8. Edited dimension notes for holes.		
		14	Removed note (1). Added profile views for both parts, and edited hole dimension note.		
		15	Placed assembly on its own page and added part balloons and edited dimensions. Also edited treatment spec for i3, i4, and i5		
		16	Placed part i5 to its own page, and edited dimensions		
		17	Adjusted spacing, added dimensions, and added bend note		
		18	Removed all metric dual units, and edited item numbers. Also changed title block.		
		19	Edited dimension		
		21	Removed dual unit from weld note, and changed font size for note		
		25	Changed orientation of Plan view for part b10, and changed font size for part notes. Also Edited dimension notes, and title block.		
		26	Added page and part views		
		27	Added page and part views		

		28	Added page and part views		
		29	Added page and part views		
		30	Adjusted dimension font size and spacing, also edited the dimensions themselves.		
		BOM	Added line for existing bridge deck. Edited descriptions for b4, b6, g1, g2, g3, g4, and i1 through i10. Edited Material specs for h2, h3, and h4. Edited Treatment specs for c7, h2, h3, h4, and h6. Combined d8 and c10 since they are different configurations of the same part.		
3	4/8/2020	1	Added note and numbers for Bridge rail. Made the rebar and unused hardware hidden.	SKR	JRF
		3	This page used to be page 9. Hid unused anchors and rebar from the existing bridge deck. Moved part balloons. And moved notes.		
		4	Added dimensions and Assembly notes. Made the unused anchorage details hidden.		
		5	Added page, added splice detail view		
		8	Replaced part h2 in the anchor bracket with part h3		
		10	Adjusted dimensions		
		16	Added component views from assembly to the same page as assembly view		
		21	Added component views from assembly to the same page as assembly view		
		22	Added component views from assembly to the same page as assembly view		
		31	Changed the dimensions for part h2		
		BOM	Added W6x8.5 Option to d1, d2, and d3		
		ALL	Reordered the sheets, and relettered the Detail views and Section views		
		1	Removed rebar from elevation view, and added the circle for detail view E		
		2	Removed part balloon b11 from Section A—A. Added part balloon to Detail B. Removed unused anchor rods.		
		7	Edited part balloon b10		

4	4/15/2020	9	Moved Weld note to opposite corner and spaced out the part views from the assembly views	SKR	JRF
		11	Added Detail E as a Top view of the transition section. Also changed page scale.		
		13	Added dimensions for both Assembly views		
		15	Changed dimension on Part i9		
		18	Added notes and extended the views to include the first post of the bridge rail		
		19	Edited dimensions		
5	4/29/2020	1	Edited impact notes and notes (2) and (3)	SKR	JRF
		10	Adjusted the ends of the bridge rail tubes to be 3/4" apart. Removed unnecessary dimensions.		
		12	Added note		
		16	Added note		
		18	Added notes and changed dimension from 32" to 31"		
		24	Changed part balloon c10 to a quantity of 2x from 11x		
		28	Changed part f7 to be 21" long		
		BOM	Added notes to the 2nd and 3rd pages		
6	5/14/2020	1	Edited Notes section, added B in front of the numbered bridge posts, edited STBRT-2 impact note	SKR	JRF
		2	Removed the ground line and the ground line note, added part balloon for c8		
		9	Edited dimension		
		10	Edited dimensions, edited font sizes, fixed assembly so that last agt post to first bridge post remains at 108"		
		11			
		12	Removed fabricator note, replaced slot with hole on part i1		
		13	Added fabricator note, moved part balloons		
		14	Shortened slots on part i6		
		15	Shortened slots on part i9		
		17	Shortened slot on part i3		
		18	Edited Notes section, removed part label for d8, added "Nested" to Part a1, added dimensions		
		19	Added a section view looking at post no 11, and changed the source for the other section views.		

		20	Edited font sizing, moved dimensions, edited title block, shortened the breaks for parts d3 and d4		
		23	Edited dimensions		
		24	Added and edited part balloons		
		25	Added Page and Assembly view		
		27	Added detail view S and adjusted other views to fit. The diameter is correct for the smaller slots. The radius is 3/4"		
		28	Added detail views T and U, Added dimensions and adjusted text.		
		29	Changed f7 to 3/4" dia		
		BOM	Updated part f7 to be 21". Part c8 (c9 previously) is a part of the bridge rail anchorage. A part balloon for c8 was placed on Sheet 2		
7	6/2/2020	10	Removed 59" dimension.	SKR/JDR	LJP
		11	Added g1 washers under f7 bolt heads.		
		30	Part g1 changed to 3/4". Part h3 changed to 3/4". Parts g6 and h8 were added.		
		BOM	Description: f7, g1, h3 Parts g6 and h8 were created. These are only used in the anchor bracket. They are identical to parts g1 and h3 from previous version.		
8	6/3/2020	11	For f7 bolts, g4 washers used instead of g1, and h1 nuts used instead of h3.	JDR	LJP
		30	Parts g6 and h8 were removed.		
		BOM	Parts g6 and h8 were renumbered to g1 and h3 as they were in all versions previous to R7. The new g1 and h3 from R7 were deleted.		
9	6/29/2020	7	Added sheet description to title block.	JDR	LJP
		10	Labeled part a6. Added note 1.		
		11	Labeled part a1. Added note 1.		
		2	Removed part balloons for f14, c8, and b11. Added note		
		7	Added Note		
		24	On Detail P changed c5 label to c6		
		26	Added page. Added component views		

10	8/18/2020	29	Removed drawing of f14	JDR	JRF
		30	Added page. Added end shoe component view, and moved transition rail to this page.		
		BOM	Edited descriptions for c6; removed parts c8, h5, f14, and e1 through e5, and changed the quantity for c4 from 2 to 1. Renumbered		
12	11/11/2020	16	Added overall dimesnions to Top Bridge Rail Terminal Assembly	SKR	CJN
13	12/10/2020	14	Edited dimensions of parts h6 and h8 to be consistent.	SKR	LJP
		15	Edited dimensions of part h9 to be consistent.		
14	1/12/2021	All	Added notes to all parts to denote which BOM page the part materials and treatments are detailed.	SKR	SBW
		23	Changed cable ballon from c10 to c4.		
		30	Added note to denote that we are using AASHTO standards for part a6.		