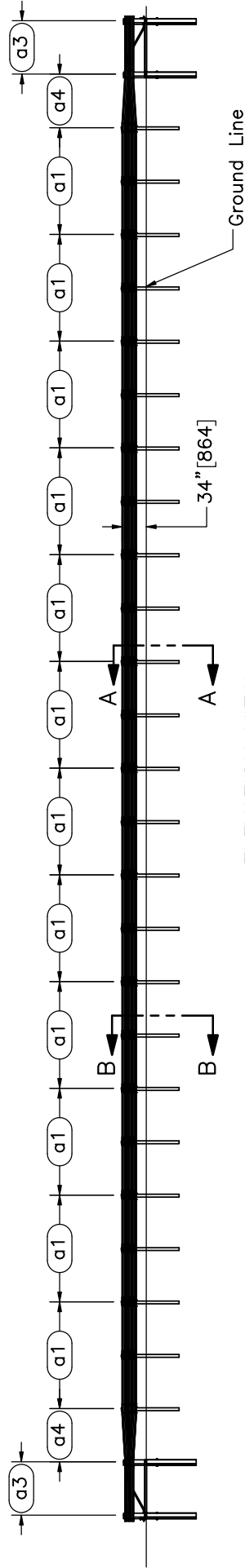



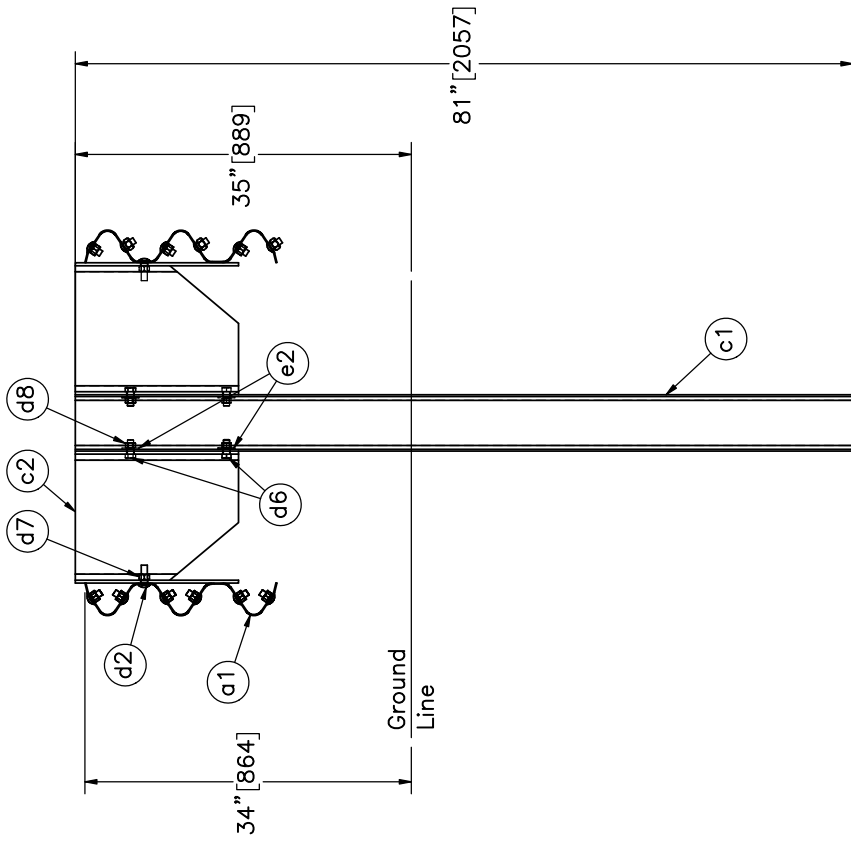
PLAN VIEW



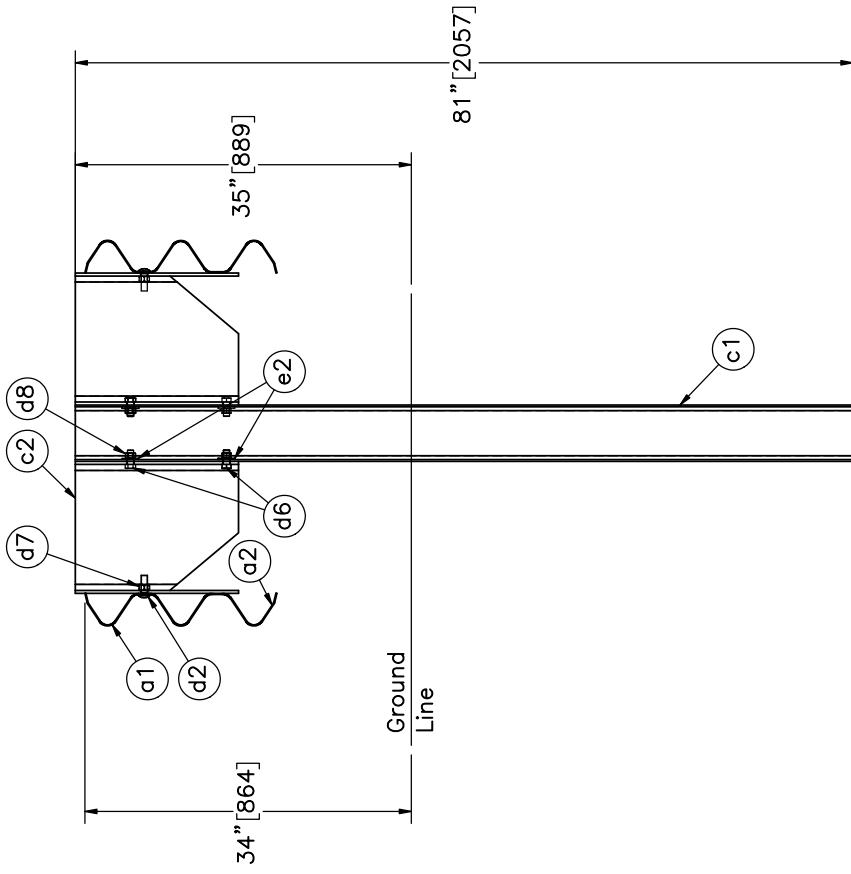
ELEVATION VIEW

| | | | |
|---|---|--|--|
|  | NJ/CA Modified Thrie Beam Test No. MTB-2 System Layout | | SHEET: 1 of 13 DATE: 1/18/2019 DRAWN BY: GRJ/MBD/JEK/AJS REV. BY: JEK/RWB/KAL |
| | Midwest Roadside Safety Facility | | DWG. NAME: MTB-2_RB SCALE: 1:220 UNITS: in,[mm] |

- Note: (1) Test shall be performed according to test designation no. 3-10 according to MASH 2016 criteria.
 (2) The impact location is 88 13/16" [2256] upstream from post no. 13.
 (3) BCT anchors are placed in ϕ 3' [914] holes, then backfilled and tamped with soil.
 (4) Critical region is between post nos. 9 and 17.
 (5) Front and backside rails are offset 2 1/4" [57] from each other.



SECTION A-A
All Odd Post Nos. Excluding Post Nos. 1 & 29



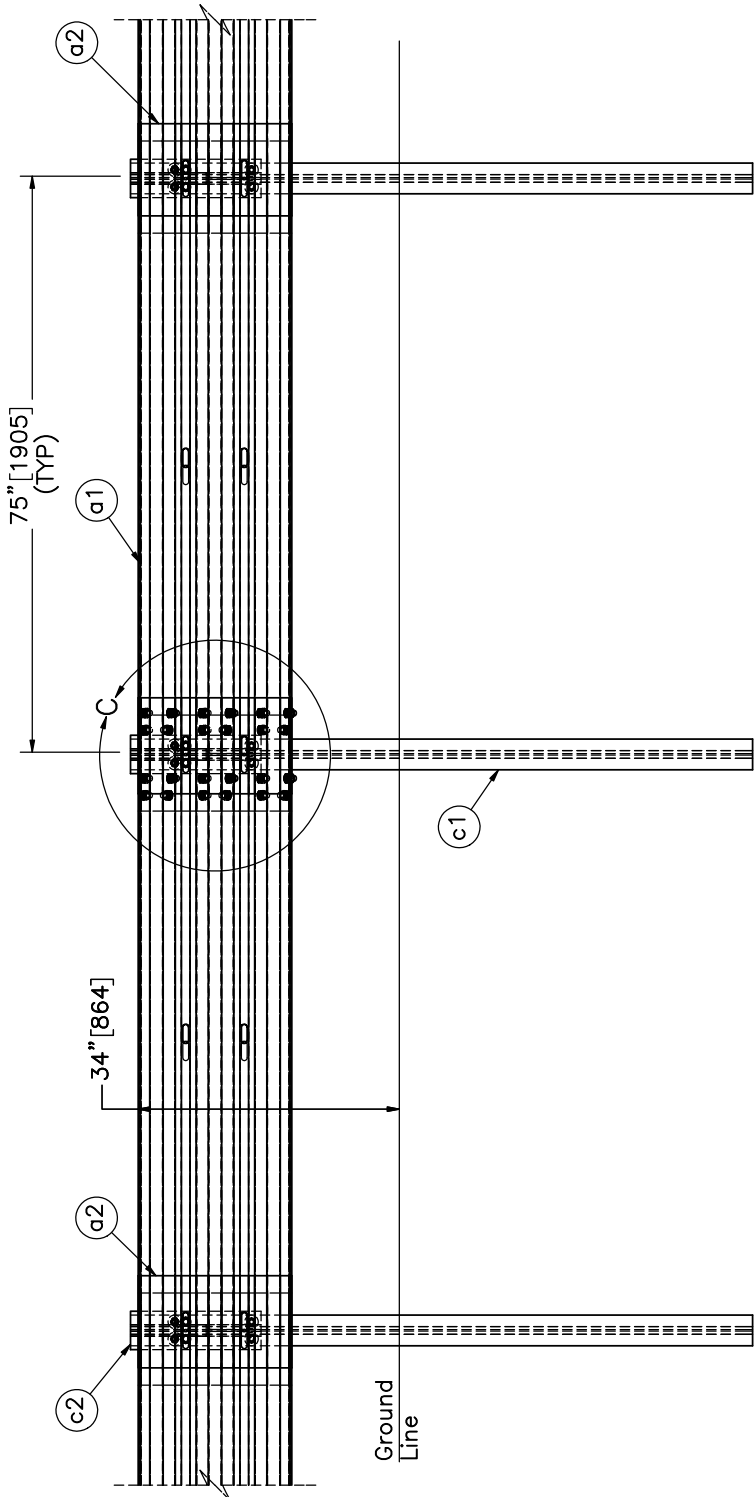
SECTION B-B
All Even Post Nos. Excluding Post Nos. 2 & 28

Note: (1) Backup plates (part a2) are placed at non-splice post locations.
 (2) Two post bolts (part d6) diagonally opposite (both sides) with washer (part e2) under post nut.



Midwest Roadside
Safety Facility

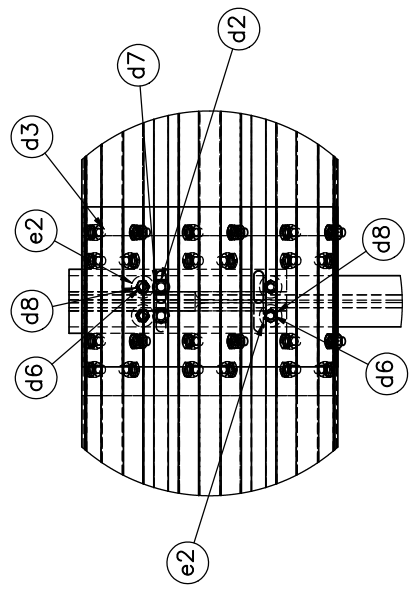
| | |
|---|------------------------------|
| NJ/CA Modified Thrie Beam Test No. MTB-2 Section Views | SHEET: 2 of 13 |
| | DATE: 1/18/2019 |
| DWG. NAME: MTB-2_RB | DRAWN BY: GRJ/MBD/JEK/AJS |
| SCALE: 1:20 UNITS: in.[mm] | REV. BY: JEK/RWB/KAL |



Post No. 22

Post No. 23
 SPLICE DETAIL
 BACKSIDE

Post No. 24



DETAIL C
 SCALE 1:15

Note: (1) Guardrail bolts (part d2) on the upstream side of the web.
 (2) Upper blockout attachment bolt (part d6) on the downstream side of the web on the traffic side. Lower bolt on upstream side of the web on the traffic side.



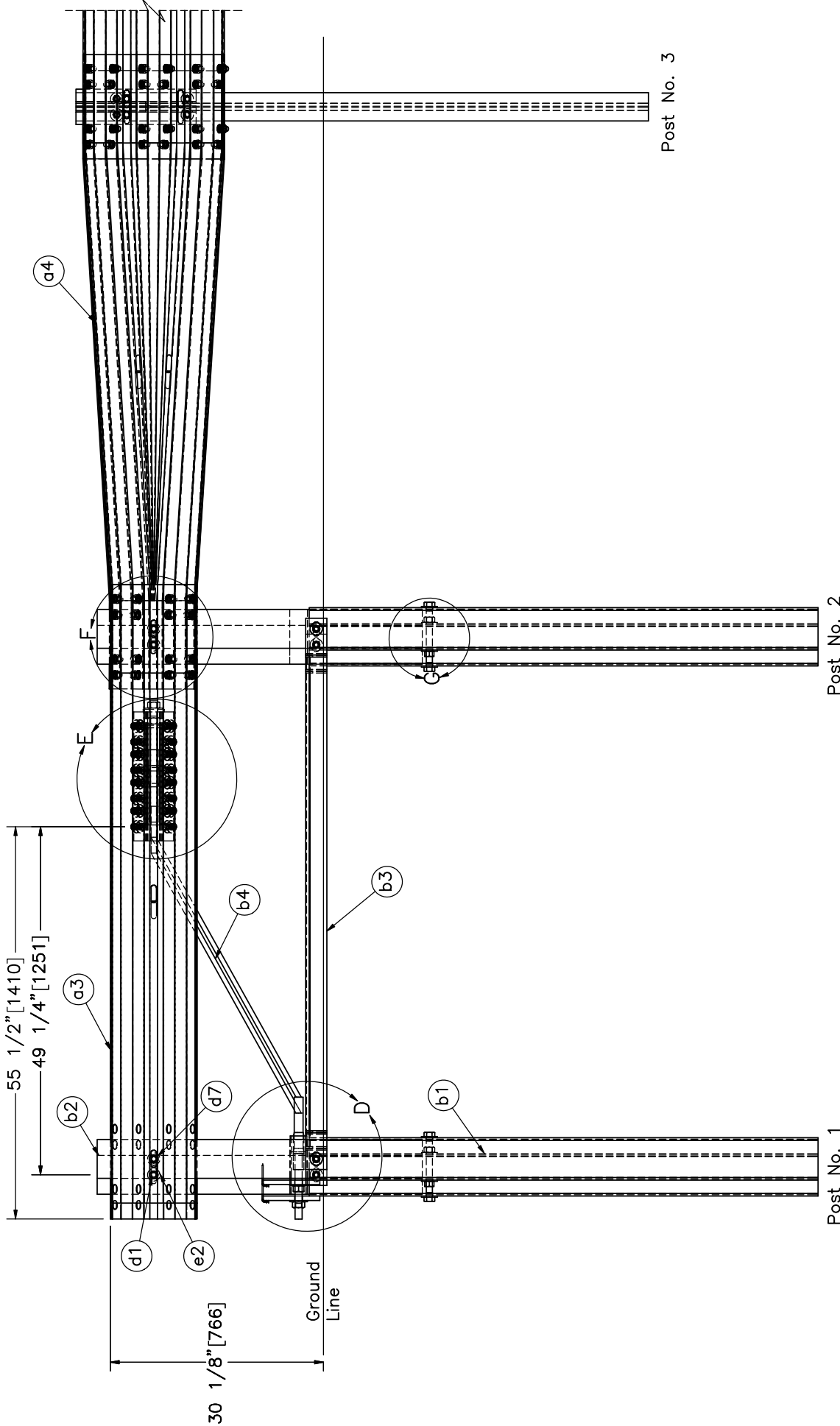
Midwest Roadside Safety Facility

NJ/CA Modified
 Thrie Beam
 Test No. MTB-2

Splice and Post Detail

| | |
|-----------|--------------------|
| SHEET: | 3 of 13 |
| DATE: | 1/18/2019 |
| DRAWN BY: | GR/AMB/J EK/AJS |
| REV. BY: | JEK/RWB/K AL |

| | |
|------------|----------|
| DWG. NAME: | MTB-2_RB |
| SCALE: | 1:25 |
| UNITS: | in./mm |




Post No. 3

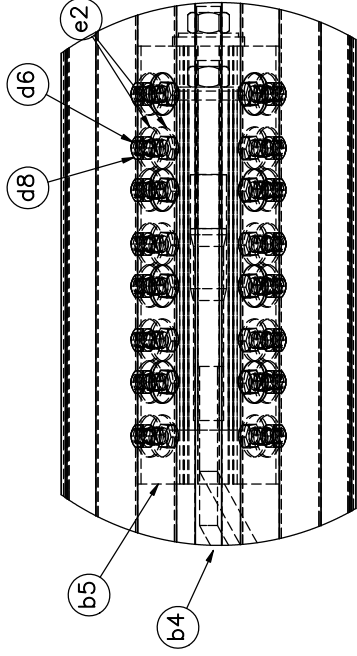
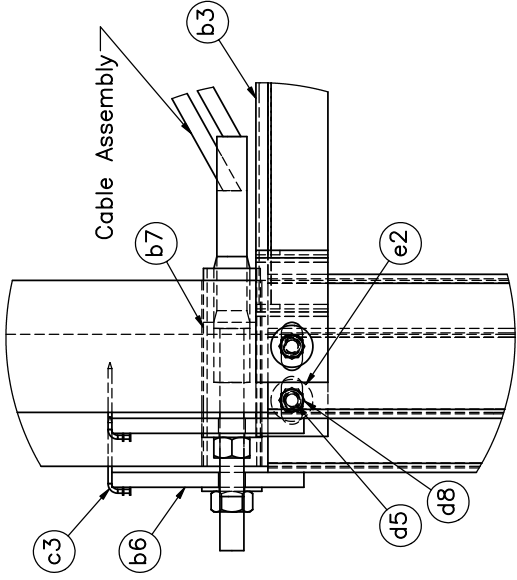
Post No. 2

Post No. 1

END SECTION DETAIL
BACKSIDE

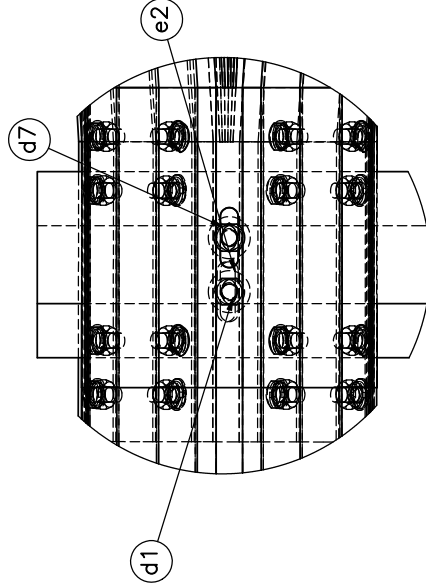
Note: (1) Downstream end section (post nos. 28 & 29) is mirrored.
 (2) BCT post (part b2) is modified to achieve 30 1/8" [765] rail height.
 (3) Front and backside rails are offset 2 1/4" [57] from each other.

| | | |
|--|---|---|
|  Midwest Roadside Safety Facility | NJ/CA Modified Thrie Beam Test No. MTB-2 End Section Details | SHEET: 4 of 13 DATE: 1/18/2019 DRAWN BY: GR/MBD/J EK/AJS REV. BY: JEK/RWB/K AL |
| | DWG. NAME: MTB-2_RB | SCALE: 1:20 UNITS: in./mm |

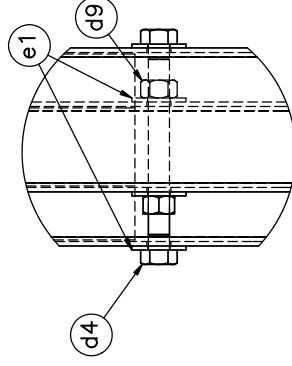


DETAIL E

DETAIL D



DETAIL F



DETAIL G



Midwest Roadside Safety Facility

NJ/CA Modified
Thrie Beam
Test No. MTB-2

BCT Anchor and Splice Details

DWG. NAME:
MTB-2_RB

SCALE: 1:8
UNITS: in, [mm]

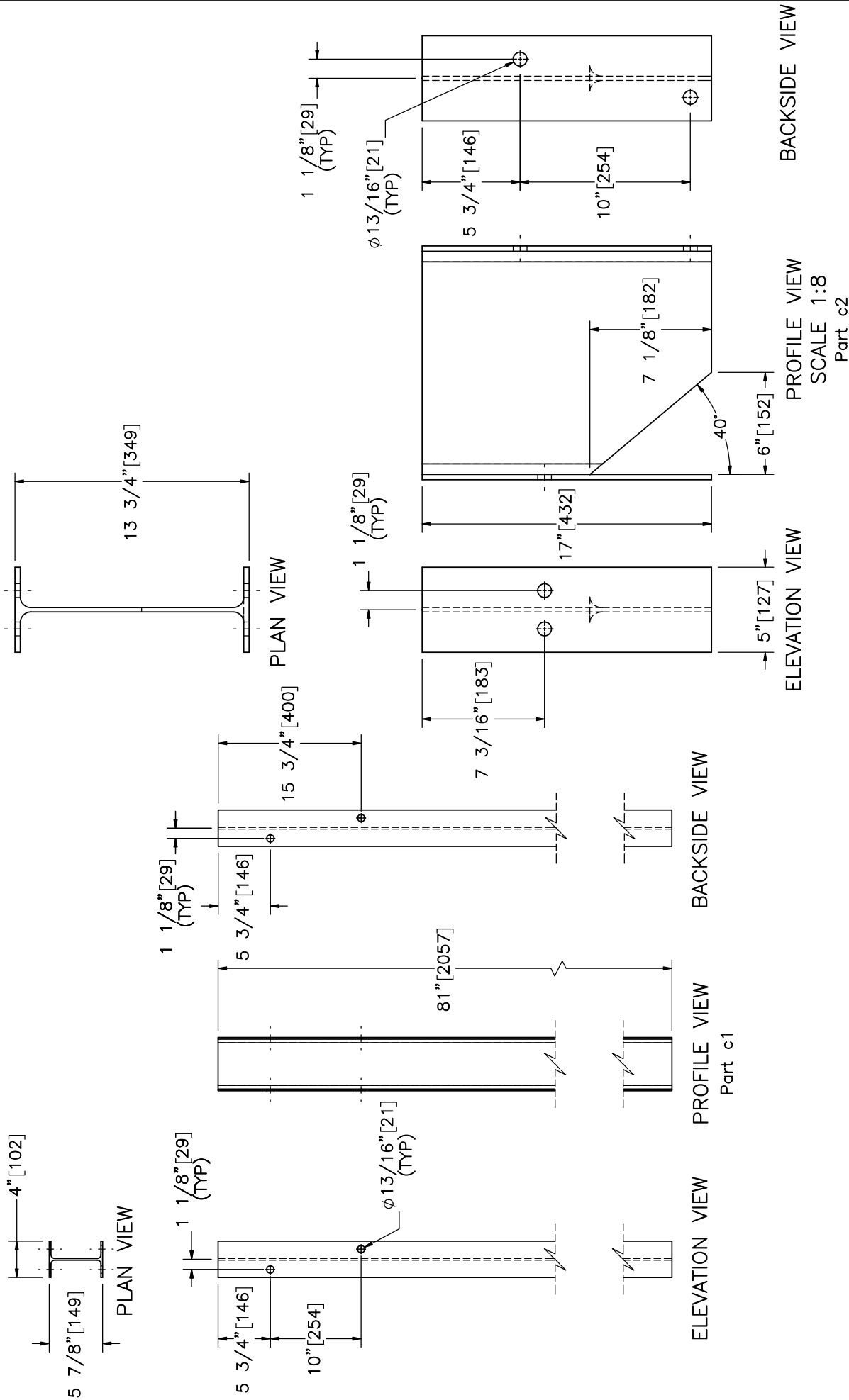
SHEET:
5 of 13


DATE:
1/18/2019

DRAWN BY:
GRJ/MBD/JEK/AJS

REV. BY:
JEK/RWB/KAL

Note: (1) Additional washer (part e2) on the opposite side under the head of bolt (part d5).



| | | |
|---|--|----------------------------------|
|  | NJ/CA Modified Thrie Beam Test No. MTB-2 | SHEET: 6 of 13 |
| | Post Nos. 3-27 Components | DATE: 1/18/2019 |
| Midwest Roadside Safety Facility | DWG. NAME: MTB-2_RB | DRAWN BY: GRJ/MBD/J EK/AJS |
| | SCALE: 1:15 UNITS: in, [mm] | REV. BY: JEK/RWB/K AL |

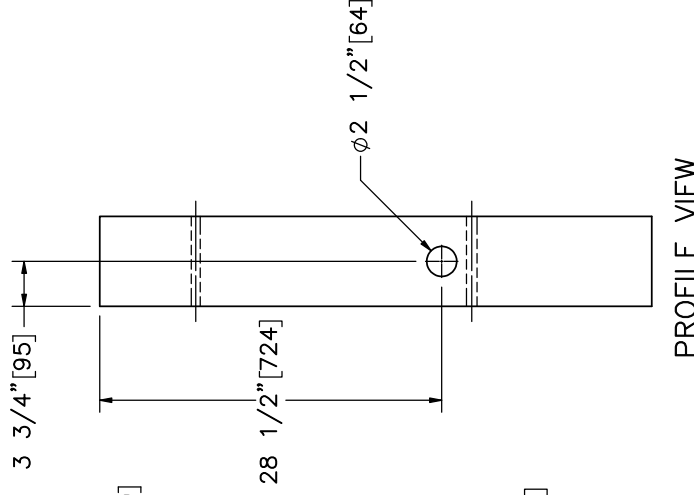
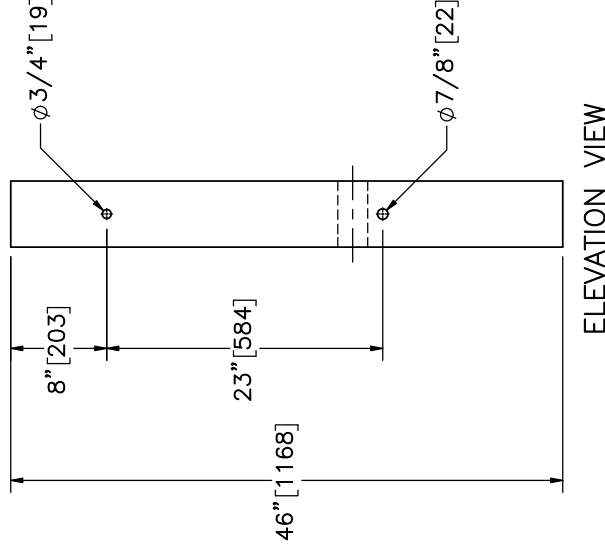
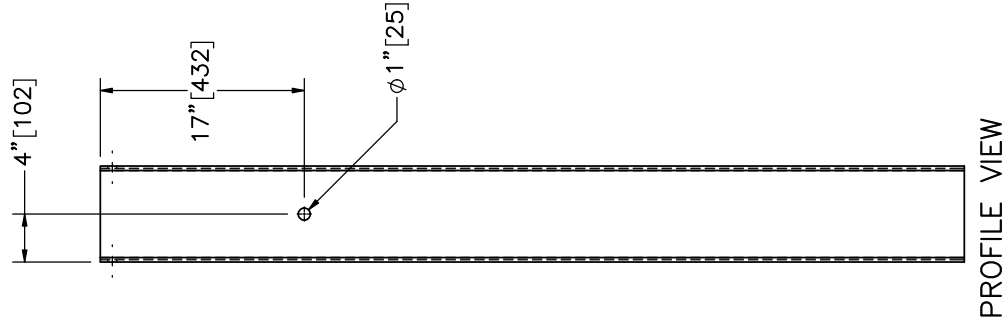
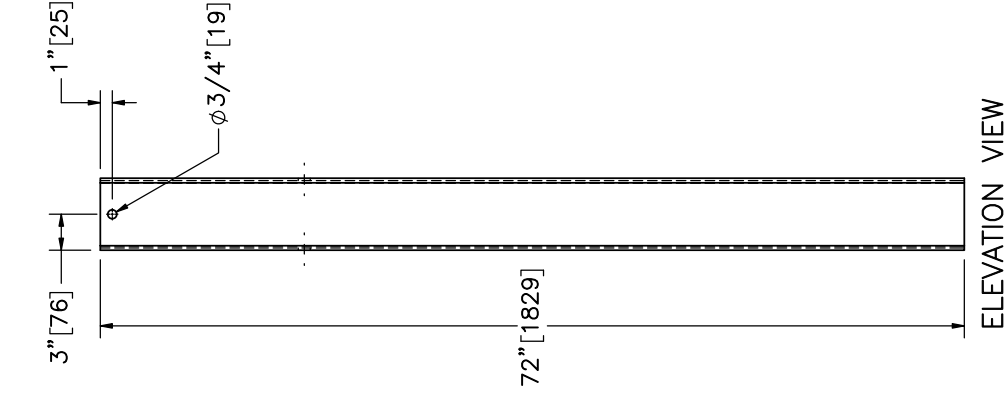
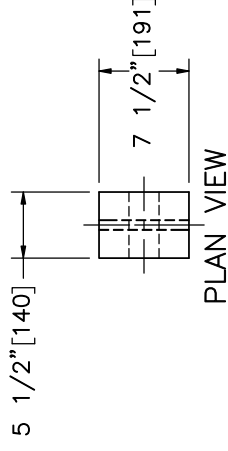
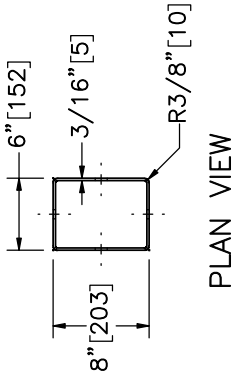
PROFILE VIEW
 SCALE 1:8
 Part c2

PROFILE VIEW
 Part c1

ELEVATION VIEW

PROFILE VIEW

BACKSIDE VIEW



Part b2

Part b1

Note: (1) BCT post (part b2) is modified for new rail height.



Midwest Roadside
Safety Facility

NJ/CA Modified
Thrie Beam
Test No. MTB-2

Foundation Tube and BCT
Timber Post Details

DWG. NAME:
MTB-2_RB

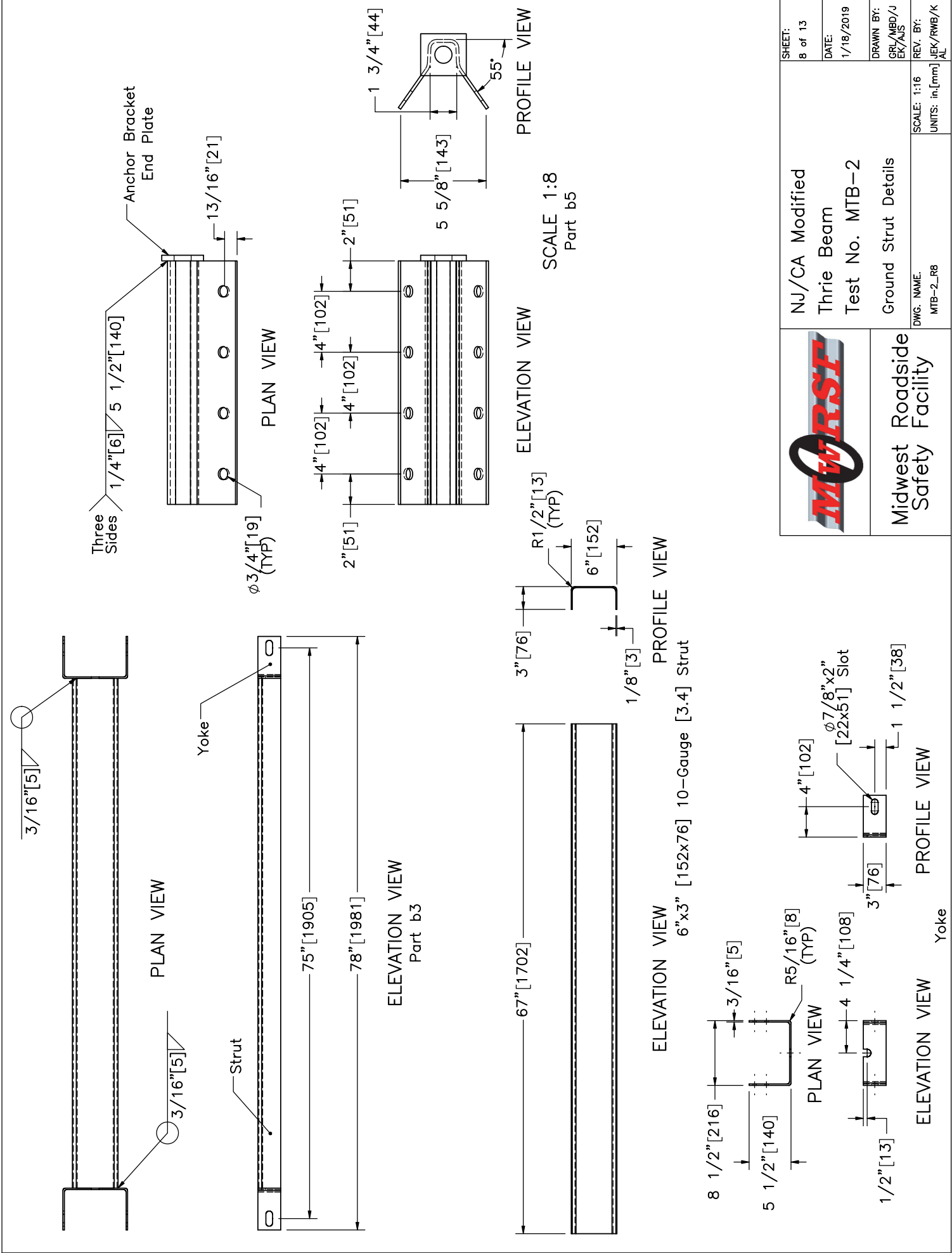
SCALE: 1:16
UNITS: in, [mm]


REV. BY:
JKK/RWB/K
AL

SHEET:
7 of 13

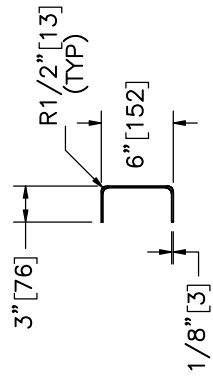
DATE:
1/18/2019

DRAWN BY:
GRJ/MBD/J
EK/AJS

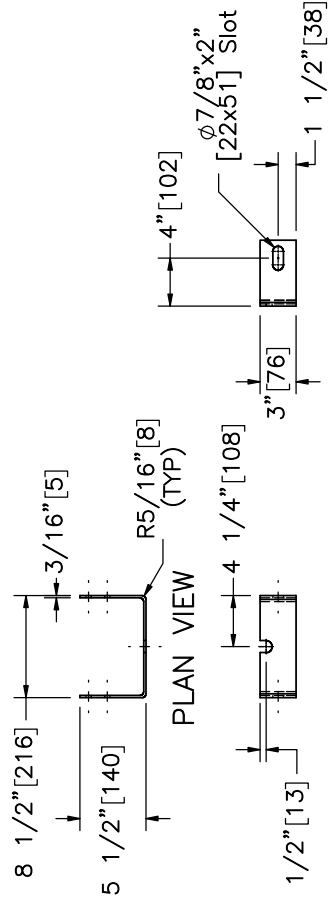


| | | |
|---|--|---------------------------|
|  | NJ/CA Modified Thrie Beam Test No. MTB-2 Ground Strut Details | SHEET: 8 of 13 |
| | | DATE: 1/18/2019 |
| DWG. NAME: MTB-2_RB | | DRAWN BY: GRJ/MBD/JEK/AJS |
| SCALE: 1:16 UNITS: in./mm | | REV. BY: JEK/RWB/KAL |

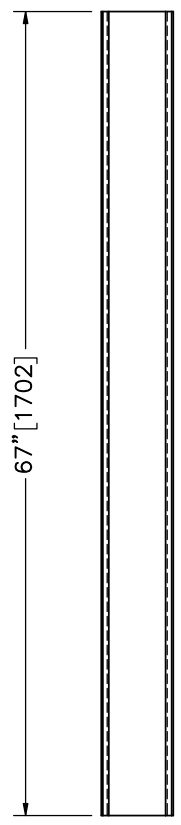
Midwest Roadside Safety Facility



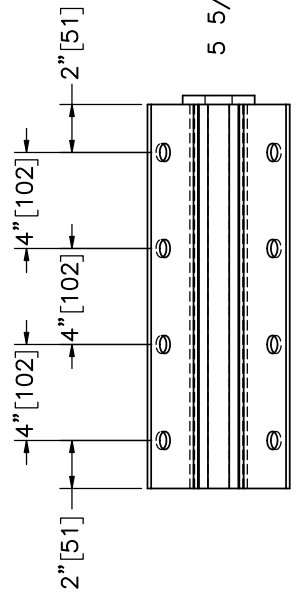
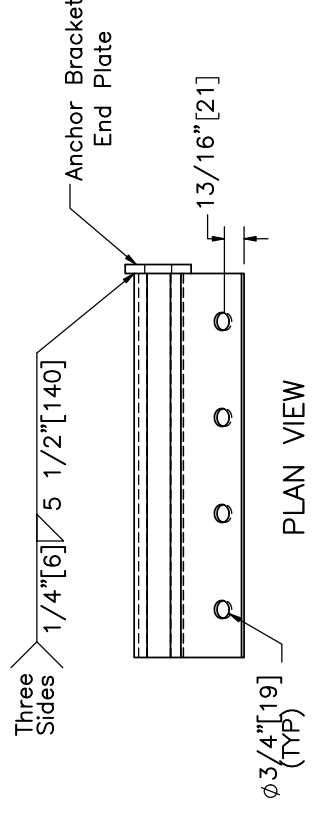
PROFILE VIEW
6" x 3" [152x76] 10-Gauge [3.4] Strut



ELEVATION VIEW Yoke
PROFILE VIEW Yoke



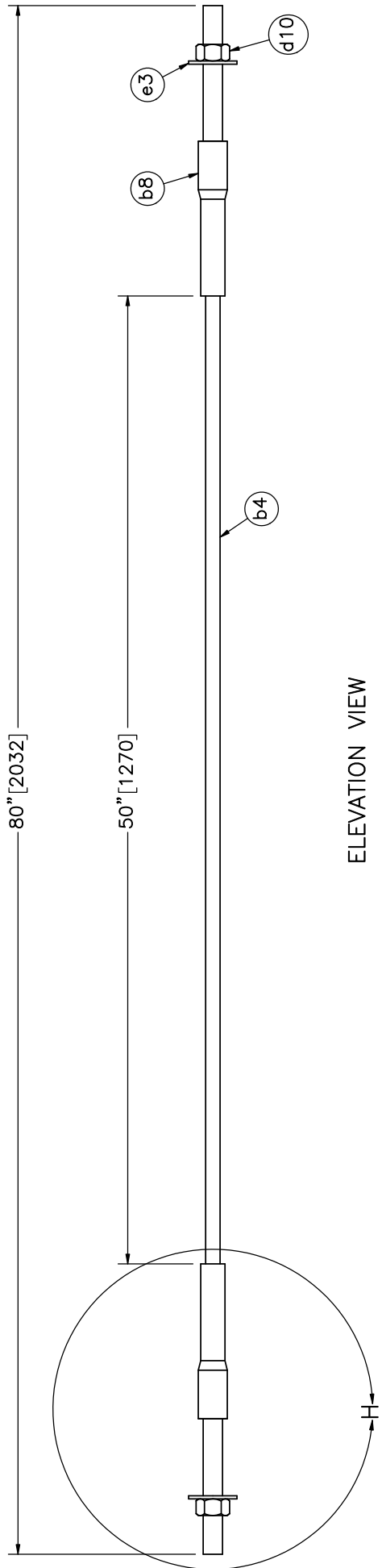
ELEVATION VIEW
6" x 3" [152x76] 10-Gauge [3.4] Strut



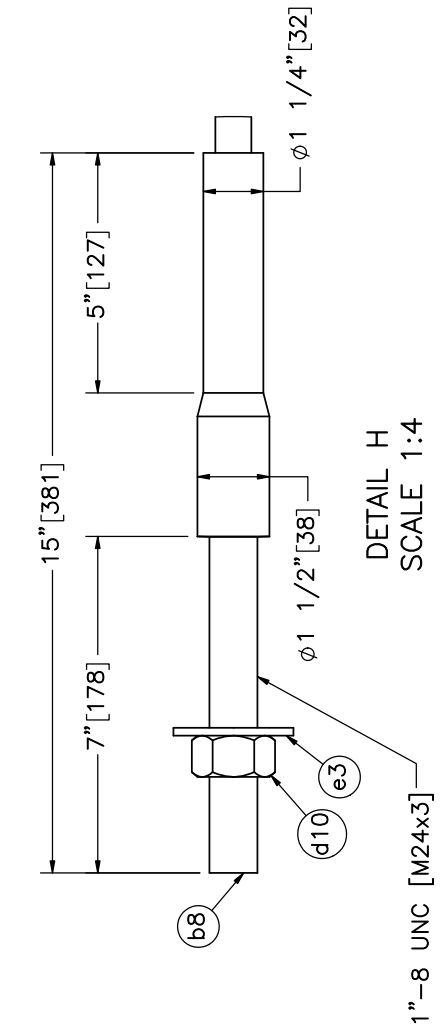
ELEVATION VIEW

PROFILE VIEW

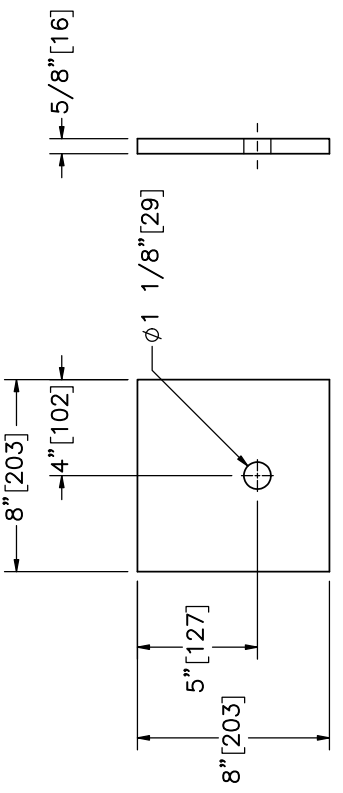
SCALE 1:8
Part b5



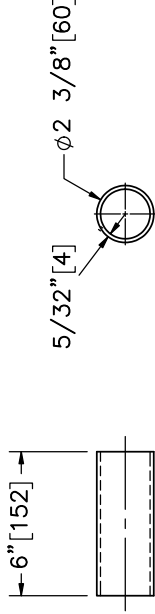
ELEVATION VIEW



DETAIL H
SCALE 1:4



ELEVATION VIEW Part b6



ELEVATION VIEW Part b7
PROFILE VIEW

| Item No. | QTY. | Description | Material Specification | Treatment Specification | Hardware Guide |
|----------|------|-------------------------------------|---|-------------------------------------|----------------|
| - | 4 | Cable Assembly | - | - | FCA01 |
| b4 | 1 | 3/4" [19] Dia. 6x19 IWRC Wire Rope | ASTM A741 Type II | Class A Coating | - |
| b8 | 2 | BCT Anchor Cable End Swaged Fitting | Fitting - ASTM A576 Gr. 1035 Stud - ASTM F568 Class C | ASTM A153 or B695 Class 55 or F2329 | - |
| d10 | 2 | 1"-8 UNC [M24x3] Hex Nut | ASTM A563A or equivalent | ASTM A153 or B695 Class 55 or F2329 | FNX24a |
| e3 | 2 | 1" [25] Dia. Plain USS Washer | ASTM F844 | ASTM A123 or A153 or F2329 | FWC24a |



Midwest Roadside Safety Facility

NJ/CA Modified Thrie Beam Test No. MTB-2

Cable Assembly

DWG. NAME: MTB-2_RB

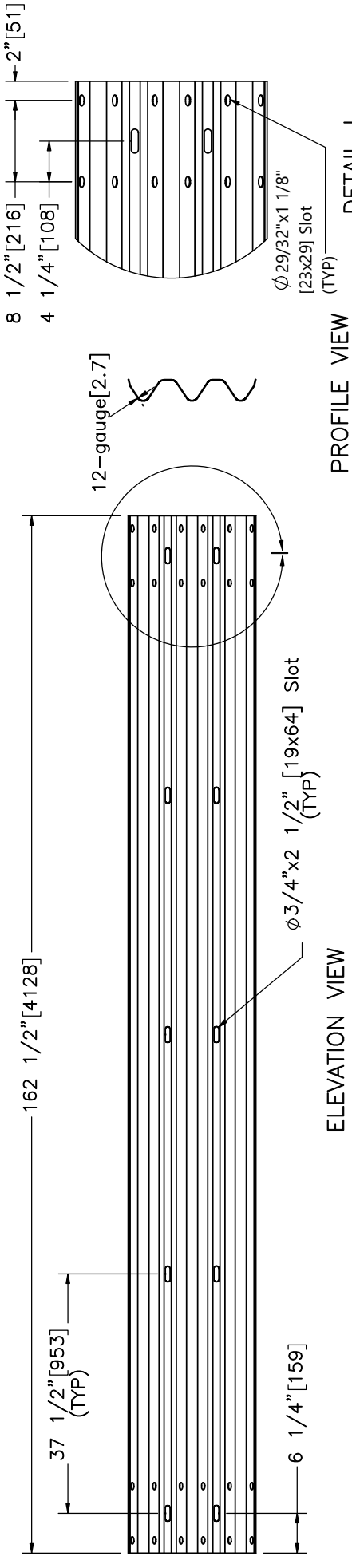
SCALE: 1:8
UNITS: in, [mm]

REV. BY: JEK/RWB/K
AL

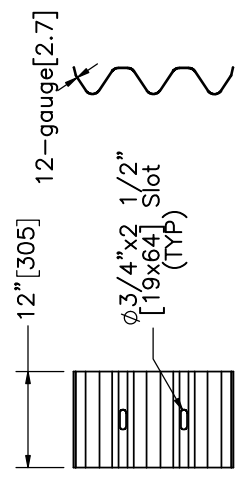
SHEET: 9 of 13

DATE: 1/18/2019

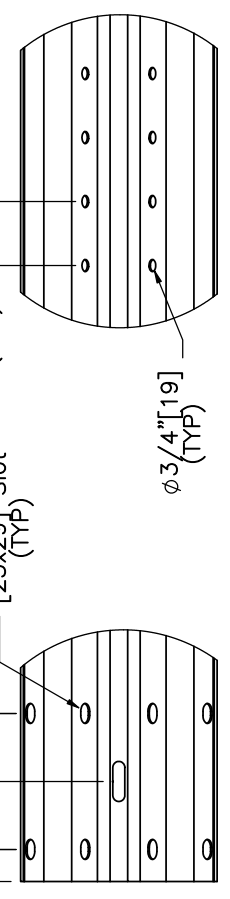
DRAWN BY: GRJ/MBD/JEK/AJS



DETAIL I
SCALE 1:16



DETAIL J
SCALE 1:12



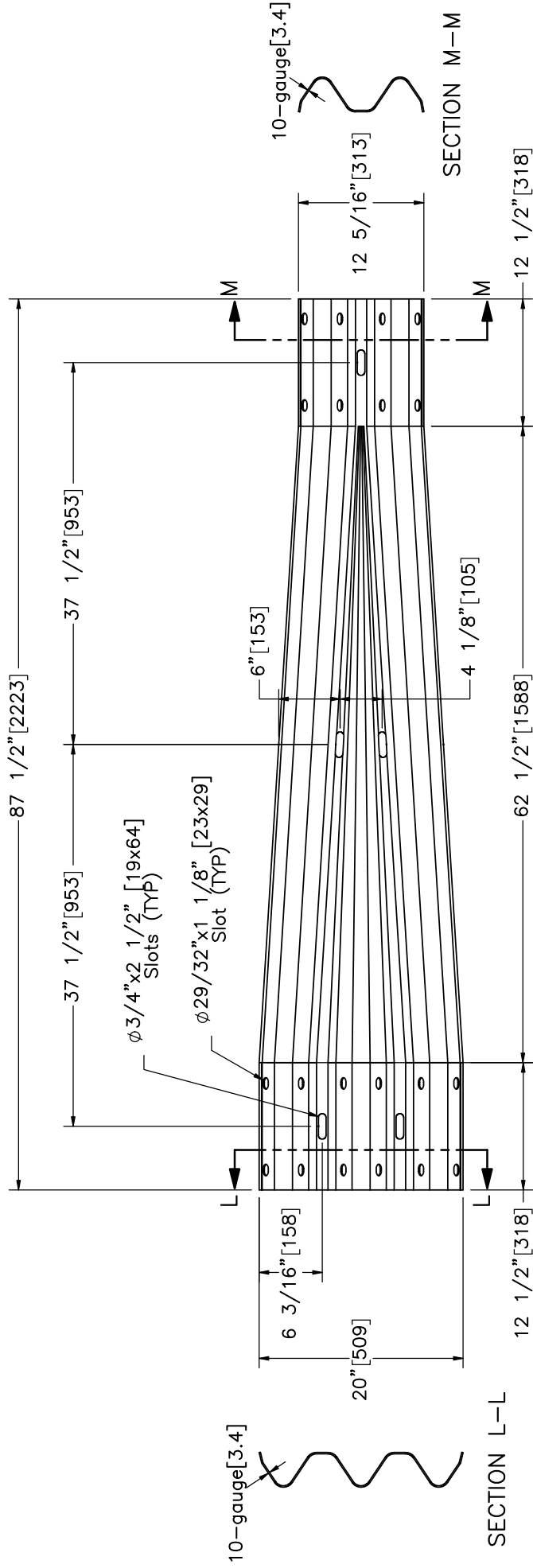
DETAIL K
SCALE 1:12




Midwest Roadside Safety Facility

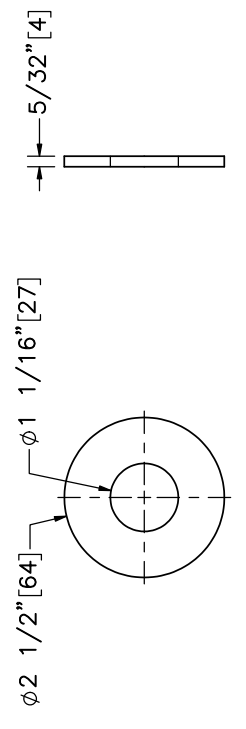
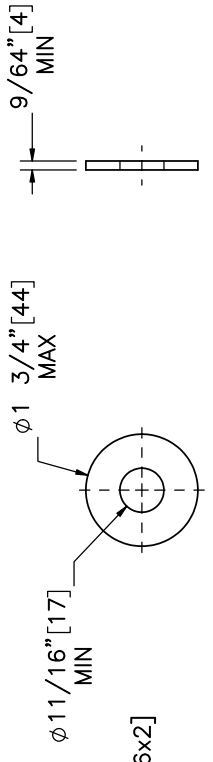
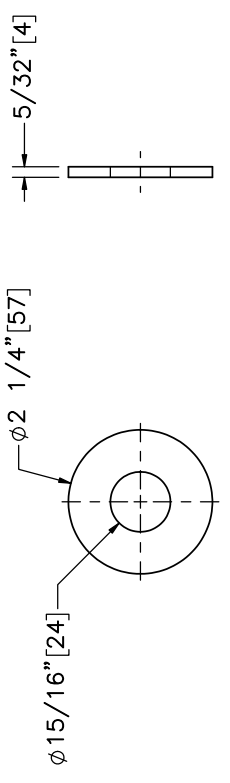
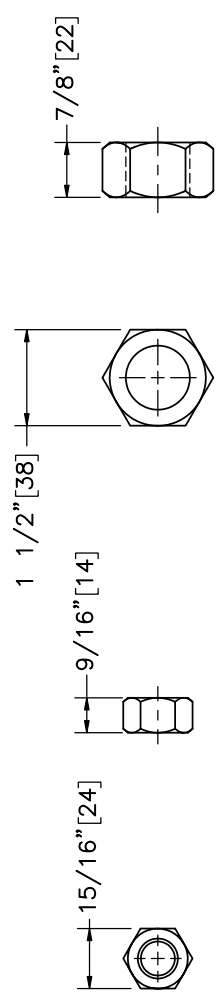
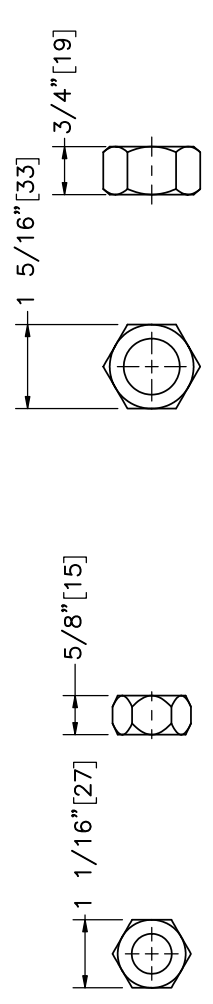
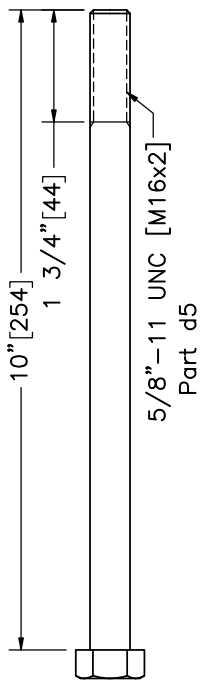
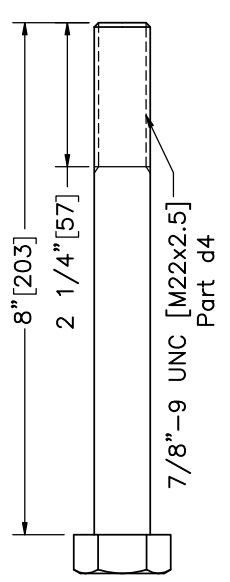
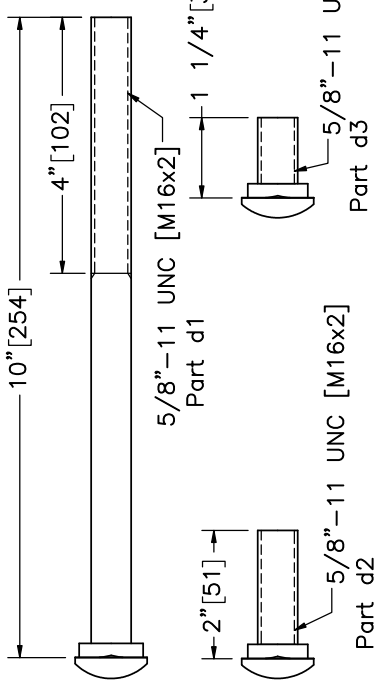
| | |
|---|---------------------------|
| NJ/CA Modified Thrie Beam Test No. MTB-2 Guardrail Section Details | SHEET: 10 of 13 |
| | DATE: 1/18/2019 |
| DWG. NAME: MTB-2_RB | DRAWN BY: GRJ/MBD/JEK/AJS |
| | REV. BY: JEK/RWB/KAL |
| SCALE: 1:24 UNITS: in./mm | |

Note: (1) Backup plate (part a2) placed at non-splice posts.



ELEVATION VIEW
Part a4

| | | | |
|---|--|-------------------------------|----------------------------------|
|  | NJ/CA Modified Thrie Beam Test No. MTB-2 | | SHEET: 11 of 13 |
| | Rail Transition Details | | DATE: 1/18/2019 |
| Midwest Roadside Safety Facility | | DWG. NAME: MTB-2_RB | DRAWN BY: GRL/MBD/J EK/AJS |
| | | SCALE: 1:15 UNITS: in.[mm] | REV. BY: JEK/RWB/K AL |



Midwest Roadside Safety Facility

NJ/CA Modified Thrie Beam Test No. MTB-2

Hardware
DWG. NAME: MTB-2_RB
SCALE: 1:3
UNITS: in, [mm]
REV. BY: JEK/RWB/K
AL

SHEET: 12 of 13
DATE: 1/18/2019
DRAWN BY: GRJ/MBD/JEK/AJS
REV. BY: JEK/RWB/K
AL

| Item No. | QTY. | Description | Material Specification | Treatment Specification | Hardware Guide |
|----------|------|--|---|--|----------------|
| a1 | 24 | 12'-6" [3,810] 12-gauge [2.7] Thrie Beam Section | AASHTO M180 | ASTM A123 or A653 | RTM04a |
| a2 | 24 | 12" [305] 12-gauge [2.7] Thrie Beam Backup Plate | AASHTO M180 | ASTM A123 or A653 | RTB01a |
| a3 | 4 | 6'-3" [3,810] 12-gauge [2.7] W-Beam MGS End Section | AASHTO M180 | ASTM A123 or A653 | - |
| a4 | 4 | 10-gauge [3.4] Symmetrical W-beam to Thrie Beam Transition | AASHTO M180 | ASTM A123 or A653 | RWT01b |
| b1 | 8 | 72" [1,829] Long Foundation Tube | ASTM A500 Gr. B | ASTM A123 | PTE06 |
| b2 | 8 | BCT Timber Post - MGS Height - Not Standard | SYP Grade No. 1 or better (No knots 18" [457] above or below ground tension face) | - | - |
| b3 | 4 | Ground Strut Assembly | ASTM A36 | ASTM A123 | PFP01 |
| b4 | 4 | 3/4" [19] Dia. 6x19 IWRC Wire Rope | ASTM A741 Type II | Class A Coating | - |
| b5 | 4 | Anchor Bracket Assembly | ASTM A36 | ASTM A123 | FPA01 |
| b6 | 4 | 8"x8"x5/8" [203x203x16] Anchor Bearing Plate | ASTM A36 | ASTM A123 | FPB01 |
| b7 | 4 | 2 3/8" [60] O.D. x 6" [152] Long BCT Post Sleeve | ASTM A53 Gr. B Schedule 40 | ASTM A123 | FMM02 |
| b8 | 8 | BCT Anchor Cable End Swaged Fitting | Fitting - ASTM A576 Gr. 1035 Stud - ASTM F568 Class C | Fitting - ASTM A153 Stud - ASTM A153 or B695 | - |
| c1 | 25 | W6x8.5 [W152x12.6], 81" [2,057] Long Steel Post | ASTM A36 | ASTM A123 | - |
| c2 | 50 | W14x22 [356x32.7], 17" [432] Long Steel Blackout | ASTM A992 | ASTM A123 | - |
| c3 | 4 | 16D Double Head Nail | - | - | - |
| d1 | 8 | 5/8"-11 UNC [M16x2], 10" [254] Long Guardrail Bolt | ASTM A307 Gr. A | ASTM A153 or B695 Class 55 or F2329 | FBB03 |
| d2 | 50 | 5/8"-11 UNC [M16x2], 2" [51] Long Guardrail Bolt | ASTM A307 Gr. A | ASTM A153 or B695 Class 55 or F2329 | FBB02 |
| d3 | 344 | 5/8"-11 UNC [M16x2], 1 1/4" [32] Long Guardrail Bolt | ASTM A307 Gr. A | ASTM A153 or B695 Class 55 or F2329 | FBB01 |
| d4 | 8 | 7/8"-9 UNC [M22x2.5], 8" [203] Long Hex Head Bolt | ASTM A307 Gr. A or equivalent | ASTM A153 or B695 Class 55 or F2329 | - |
| d5 | 8 | 5/8"-11 UNC [M16x2], 10" [254] Long Hex Head Bolt | ASTM A307 Gr. A or equivalent | ASTM A153 or B695 Class 55 or F2329 | FBX16a |
| d6 | 132 | 5/8"-11 UNC [M16x2], 1 1/2" [38] Long Hex Head Bolt | ASTM A307 Gr. A or equivalent | ASTM A153 or B695 Class 55 or F2329 | FBX16a |
| d7 | 402 | 5/8"-11 UNC [M16x2] Heavy Hex Nut | ASTM A563A or equivalent | ASTM A153 or B695 Class 55 or F2329 | FNX16b |
| d8 | 140 | 5/8"-11 UNC [M16x2] Hex Nut | ASTM A563A or equivalent | ASTM A153 or B695 Class 55 or F2329 | FNX16a |
| d9 | 8 | 7/8"-9 UNC [M22x2.5] Hex Nut | ASTM A563A or equivalent | ASTM A153 or B695 Class 55 or F2329 | FNX22a |
| d10 | 8 | 1"-8 UNC [M24x3] Hex Nut | ASTM A563A or equivalent | ASTM A153 or B695 Class 55 or F2329 | FNX24a |
| e1 | 16 | 7/8" [22] Dia. Plain USS Washer | ASTM F844 | ASTM A123 or A153 or F2329 | - |
| e2 | 188 | 5/8" [16] Dia. Plain USS Washer | ASTM F844 | ASTM A123 or A153 or F2329 | FWC16a |
| e3 | 8 | 1" [25] Dia. Plain USS Washer | ASTM F844 | ASTM A123 or A153 or F2329 | FWC24a |



Midwest Roadside Safety Facility

SHEET: 13 of 13
 DATE: 1/18/2019
 DRAWN BY: GRJ/MBD/JEK/AJS
 REV. BY: JEK/RWB/KAL
 SCALE: 1:384
 UNITS: in,[mm]
 DWG. NAME: MTB-2_RB
 Bill of Materials
 Test No. MTB-2
 Thrie Beam
 NJ/CA Modified