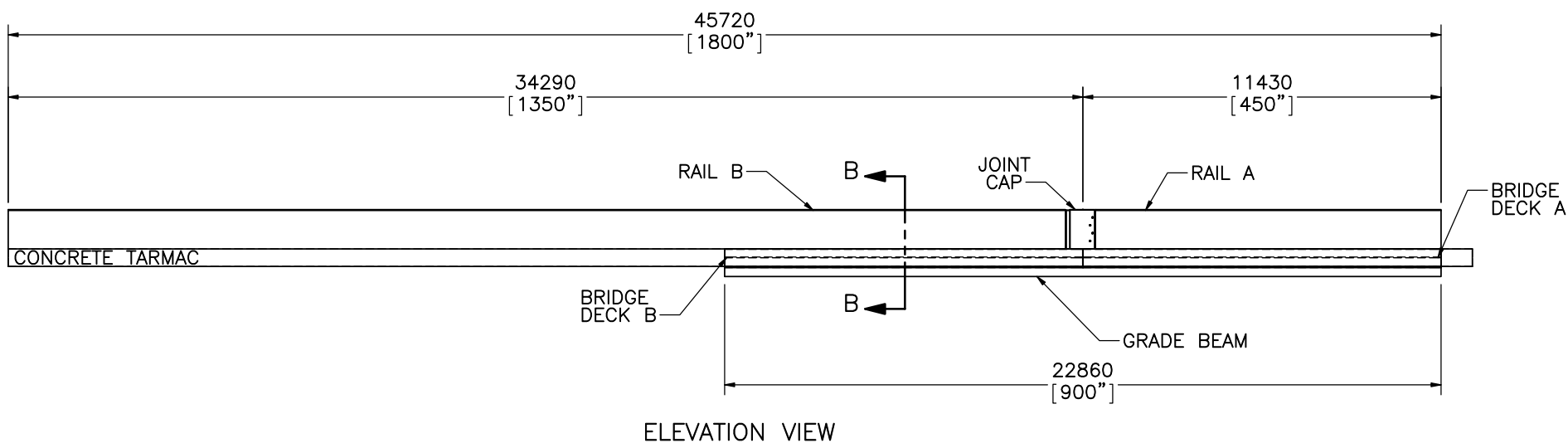
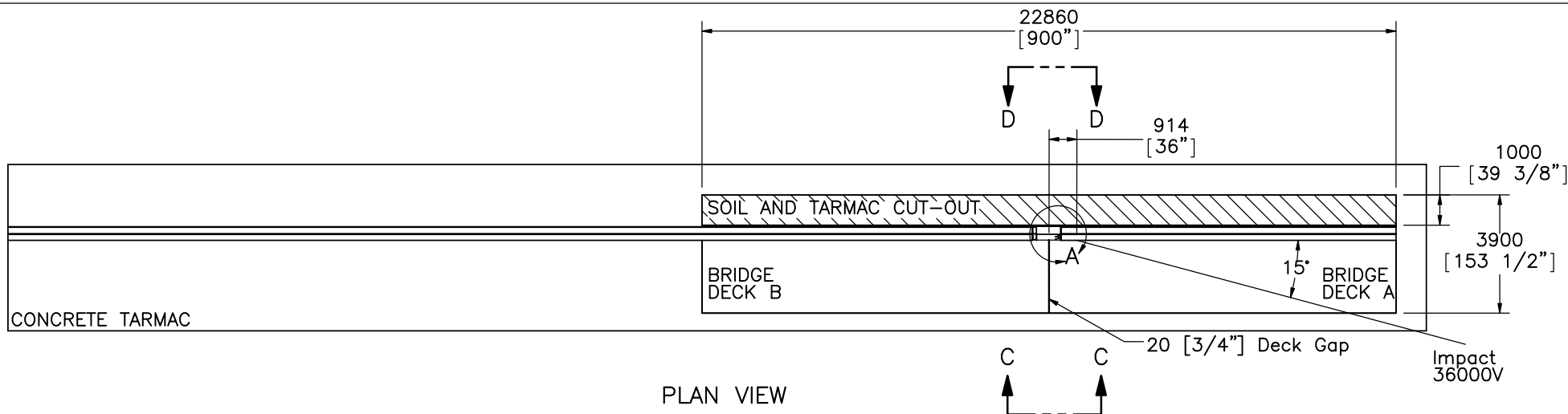




- Notes: (1) Test shall be performed according to test designation no. 5-12 of MASH.
- (2) Impact point is 914 mm [3 ft] upstream from the centerline of the bridge deck and bridge rail gap.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

System Layout

DWG. NAME.
Manitoba_R13

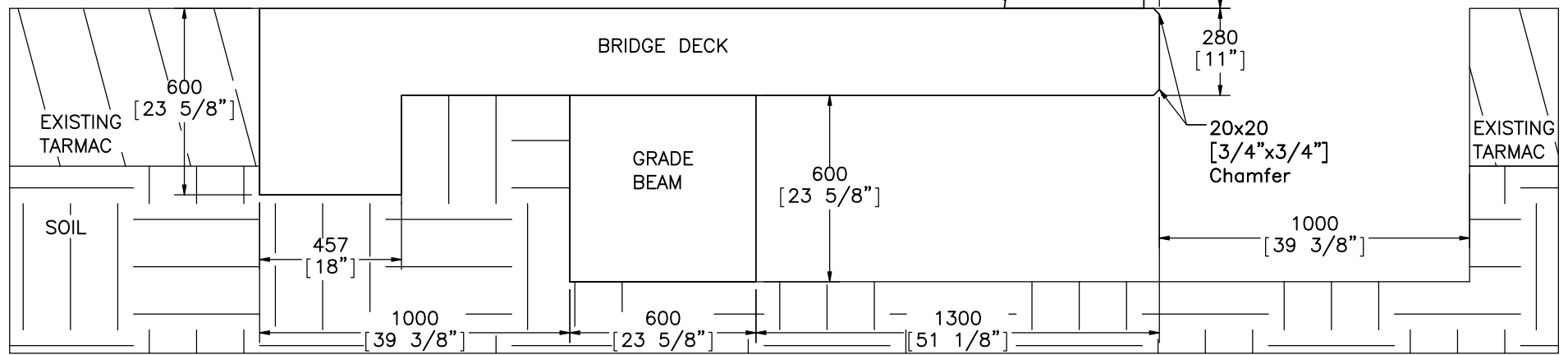
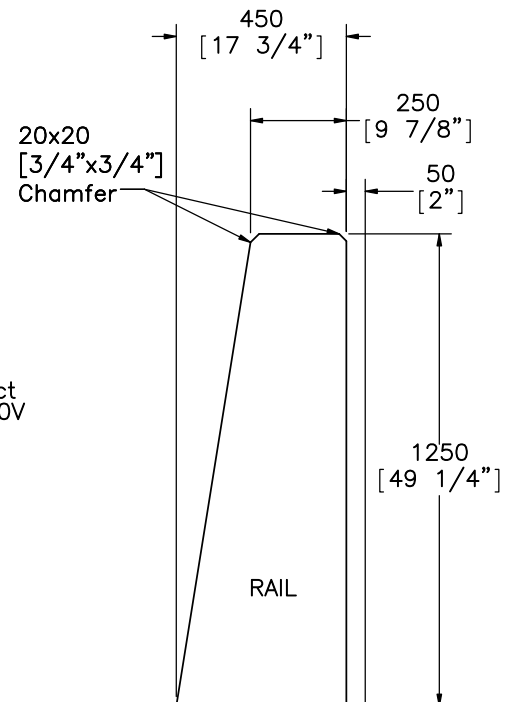
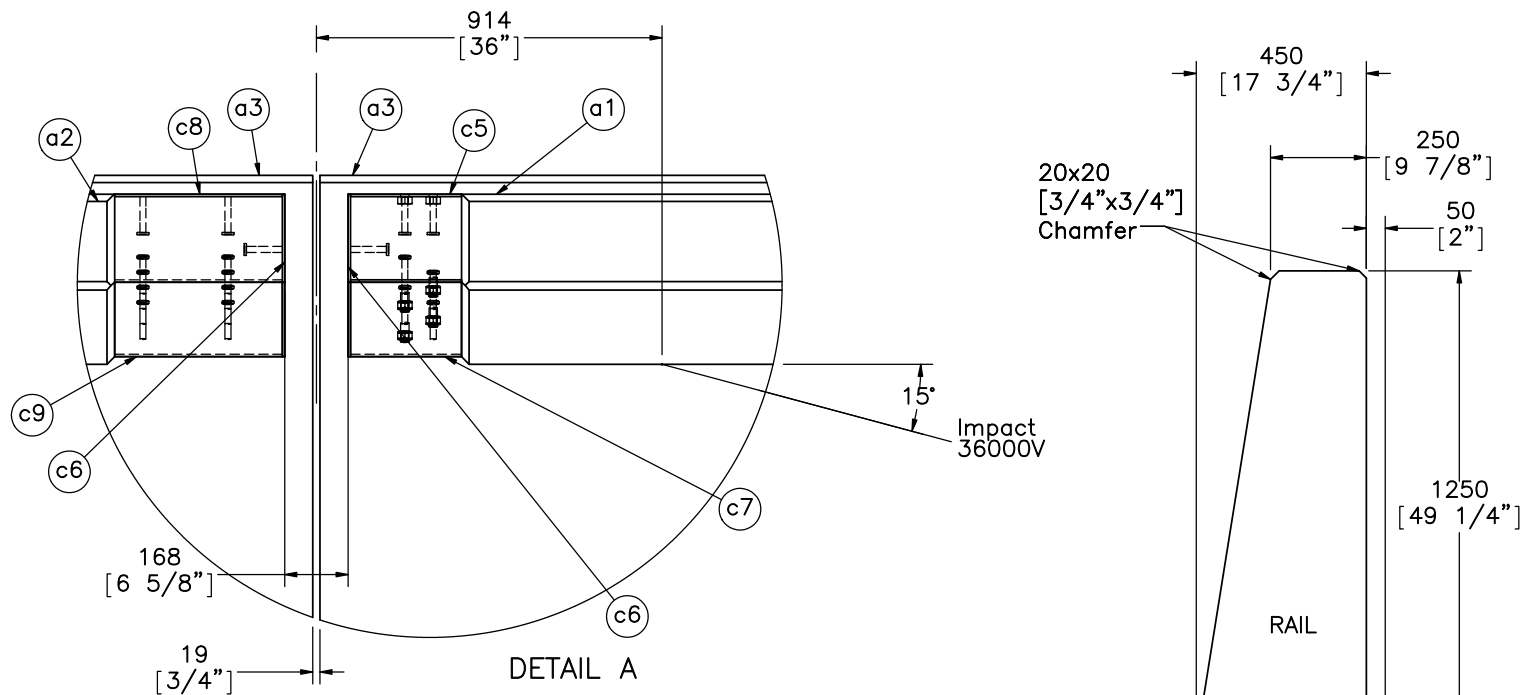
SCALE: 1:200
UNITS: mm[in.]

SHEET:
1 of 24

DATE:
4/27/2016

DRAWN BY:
JEK

REV. BY:
SKR/JDS/
KAL/RKF



SECTION B-B

Notes: (1) Joint cap hidden.
(2) Reinforcement not shown.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Layout Detail

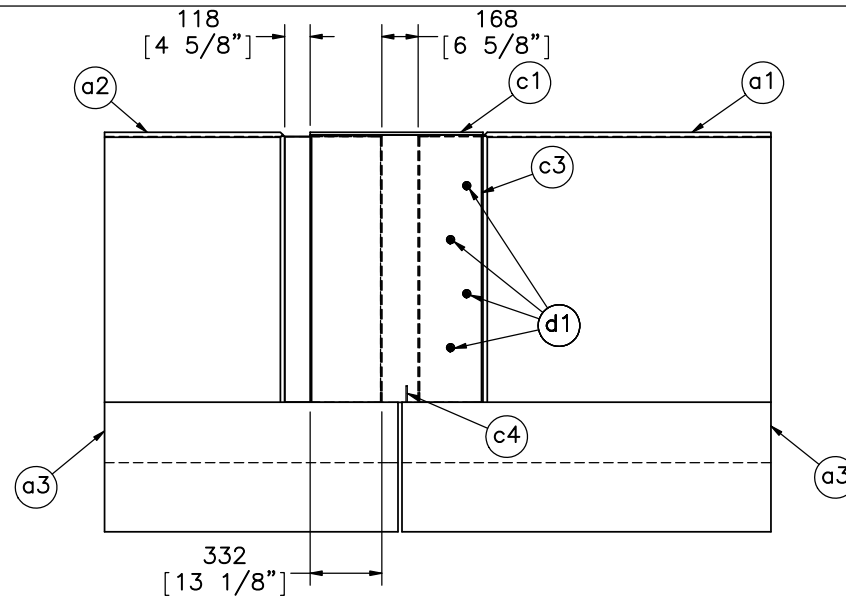
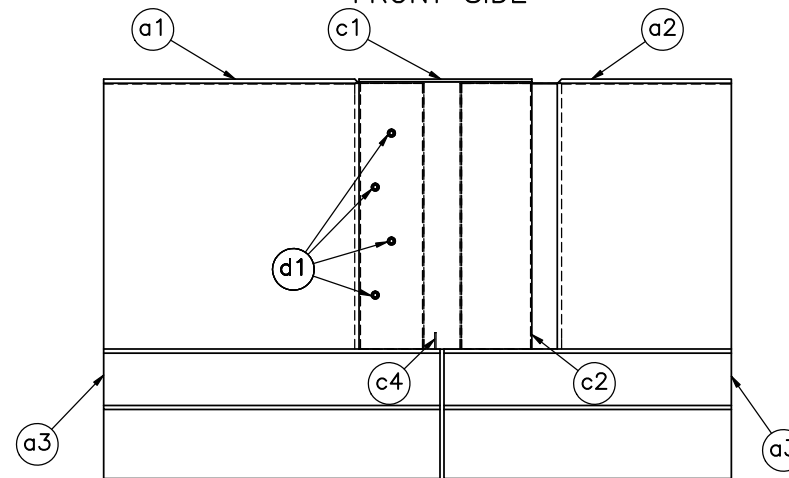
DWG. NAME.
Manitoba_R13

SCALE: 1:20
UNITS: mm[in.]

SHEET:
2 of 24
DATE:
4/27/2016
DRAWN BY:
JEK
REV. BY:
SKR/JDS/
KAL/RKF

DOWNSTREAM SIDE

UPSTREAM SIDE

SECTION C-C
FRONT SIDESECTION D-D
BACK SIDE

UPSTREAM SIDE

DOWNSTREAM SIDE

- Notes: (1) When installed, a 118 mm [4 5/8"] gap exists between the downstream end of the steel joint cap and end of the 20 mm [3/4"] recess in the barrier.
- (2) Internal reinforcement not shown.
- (3) Grade beam not shown.

Midwest Roadside
Safety FacilityManitoba TL-5 Bridge
Rail

Rail Joint

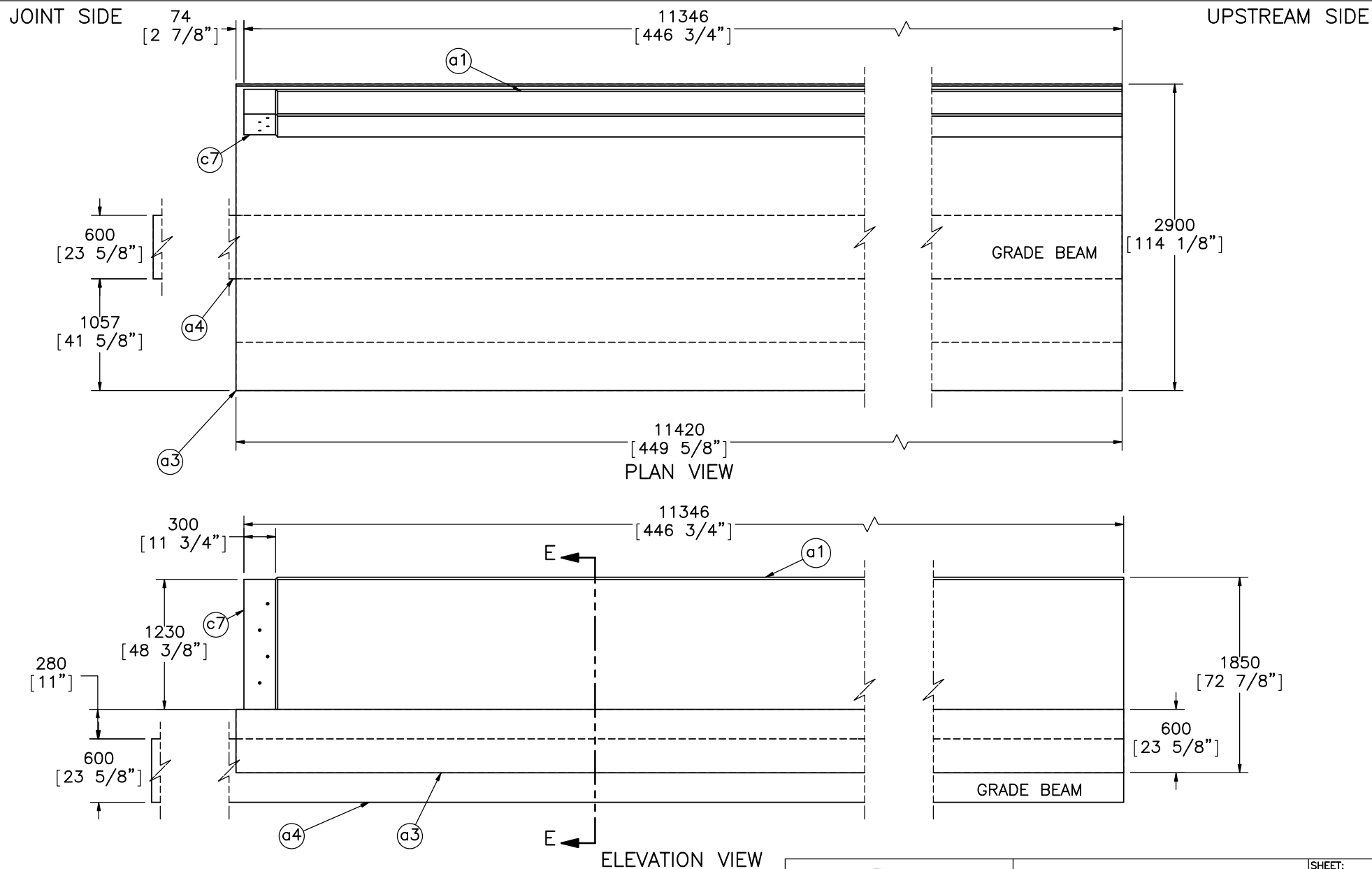
DWG. NAME.
Manitoba_R13SCALE: 1:35
UNITS: mm[in.]

SHEET:
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DATE:
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DRAWN BY:
JEK

REV. BY:
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KAL/RKF



Notes: (1) Internal reinforcement not shown.

- (2) Anchor bolts (Part d1) must be greased and installed in the upstream end cap during casting of rail to permit proper installation of joint cap after curing. Formwork will need to expose area around holes of end cap to ensure proper depth is reached.



Midwest Roadside
Safety Facility

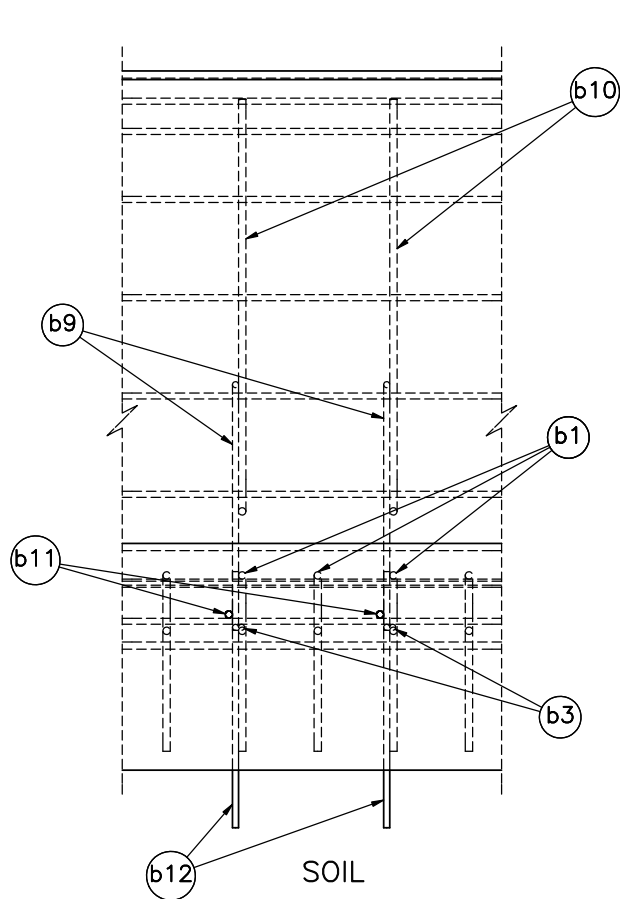
Manitoba TL-5 Bridge
Rail

Bridge Deck A and Rail A

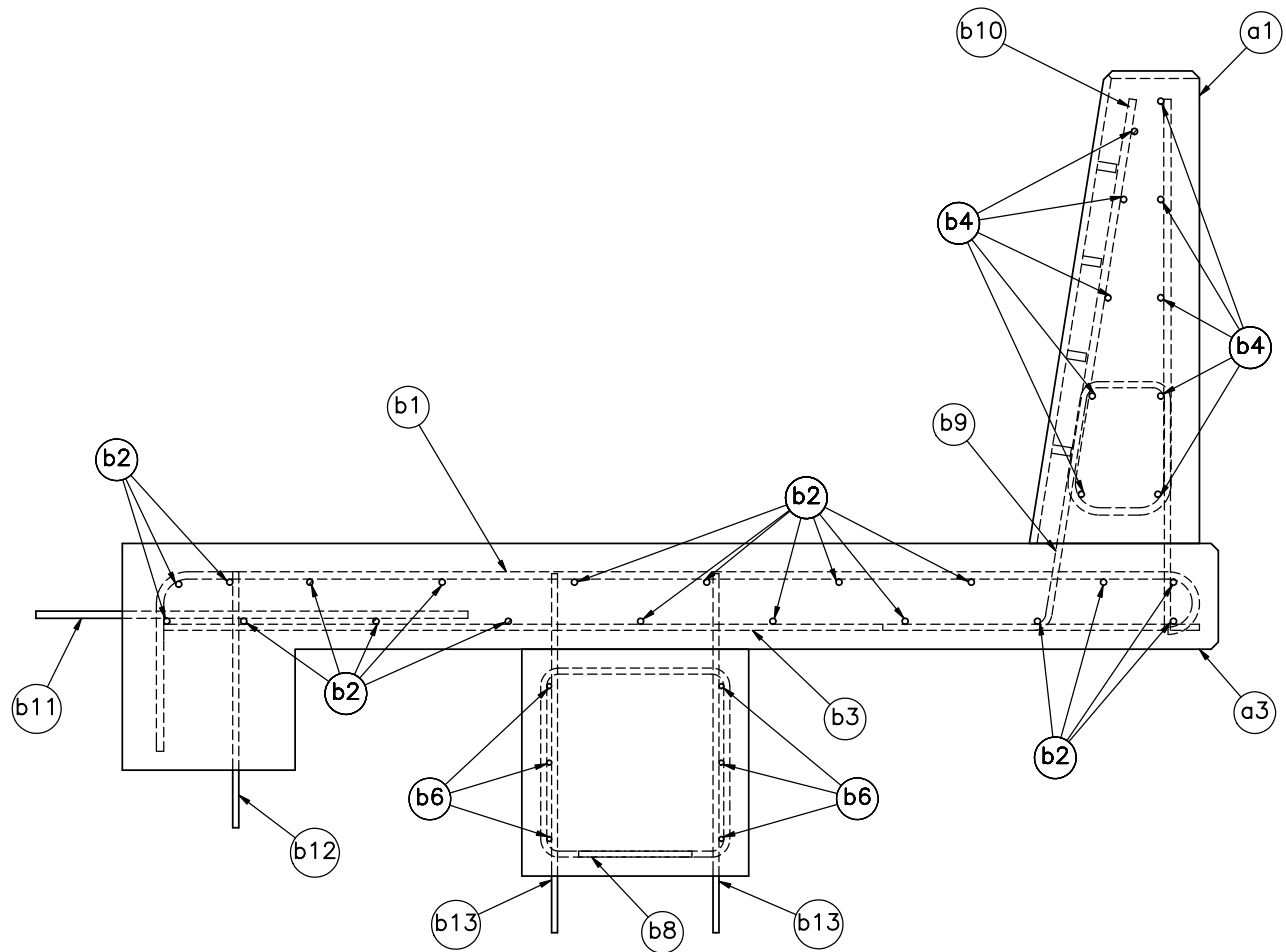
DWG. NAME.
Manitoba_R13

SCALE: 1:50
UNITS: mm[in.]

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DRAWN BY:
JEK
REV. BY:
SKR/JDS/
KAL/RKF



ELEVATION VIEW
1 m [39 3/8"] CUTOUT
RAIL A AND DECK A



SECTION E-E

- Notes:
- (1) Reinforcement bars b1, b3, and b10 are in the same vertical plane.
 - (2) Reinforcement bars b11 are to be embedded into the existing tarmac with chemical epoxy adhesive (Part e1).
 - (3) Reinforcement bars b12 and b13 are to be driven into soil.
 - (4) Grade beam not shown in elevation view.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

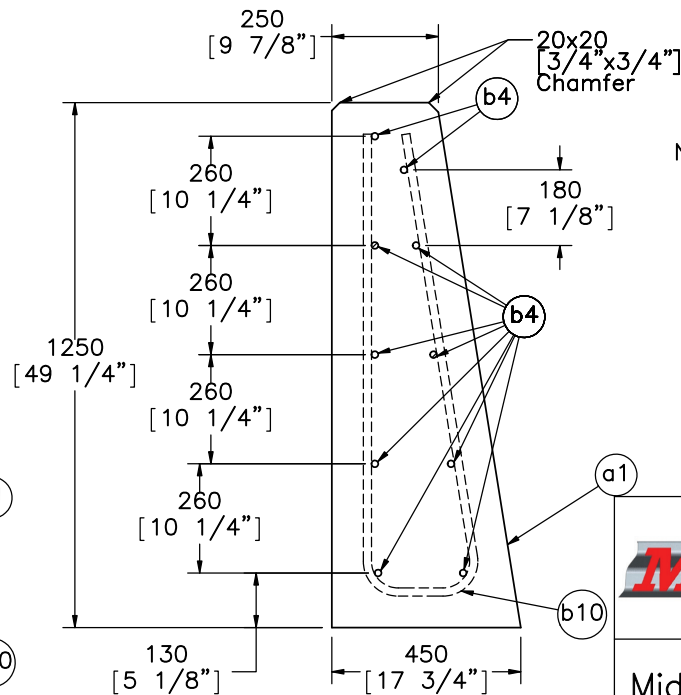
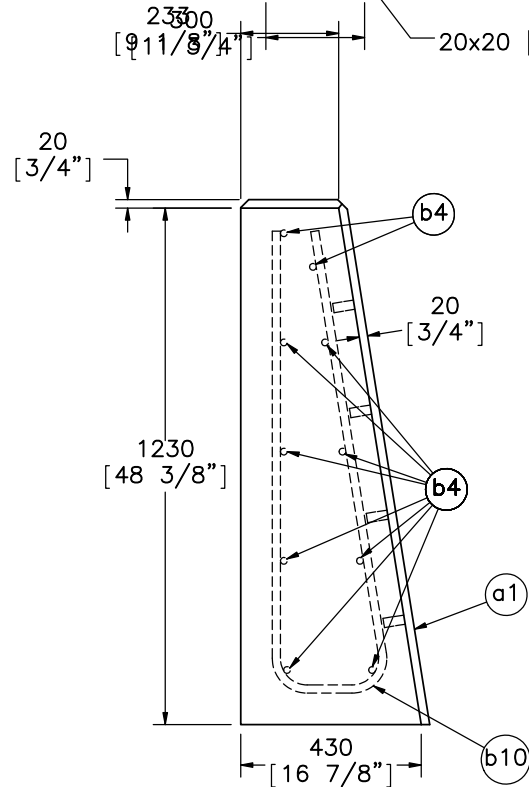
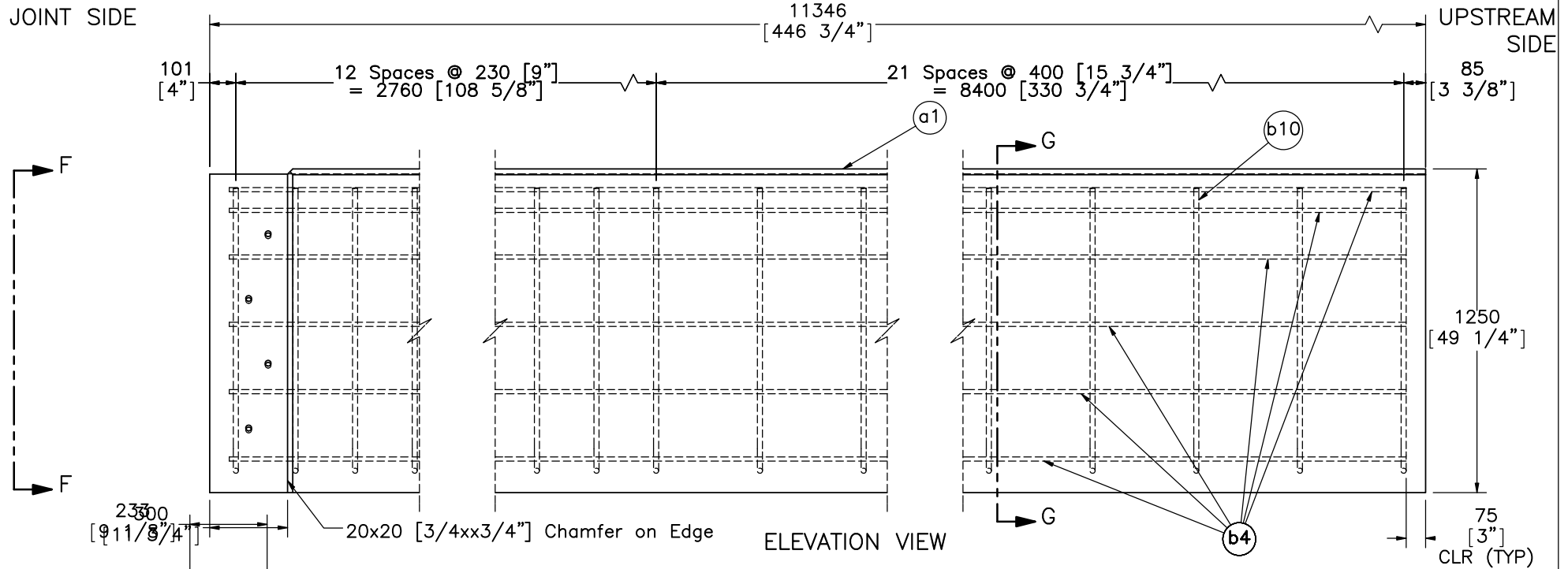
Bridge Deck A and Rail A
Reinforcement Layout

DWG. NAME:
Manitoba_R13

SCALE: 1:20
UNITS: mm[in.]

SHEET:
5 of 24
DATE:
4/27/2016
DRAWN BY:
JEK
REV. BY:
SKR/JDS/
KAL/RKF

JOINT SIDE



- Notes: (1) 75 mm [3"] cover should be used for all rail rebar.
- (2) Recess the front and top of the rail 20 mm [3/4"] to allow the joint cap to fit over the end of the rail.
- (3) Reinforcement bar b4 has a minimum lap splice length of 610 mm [24"].
- (4) Steel end cap assembly (Parts c5, c6, c7) not shown.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Rail A Detail

DWG. NAME.
Manitoba_R13

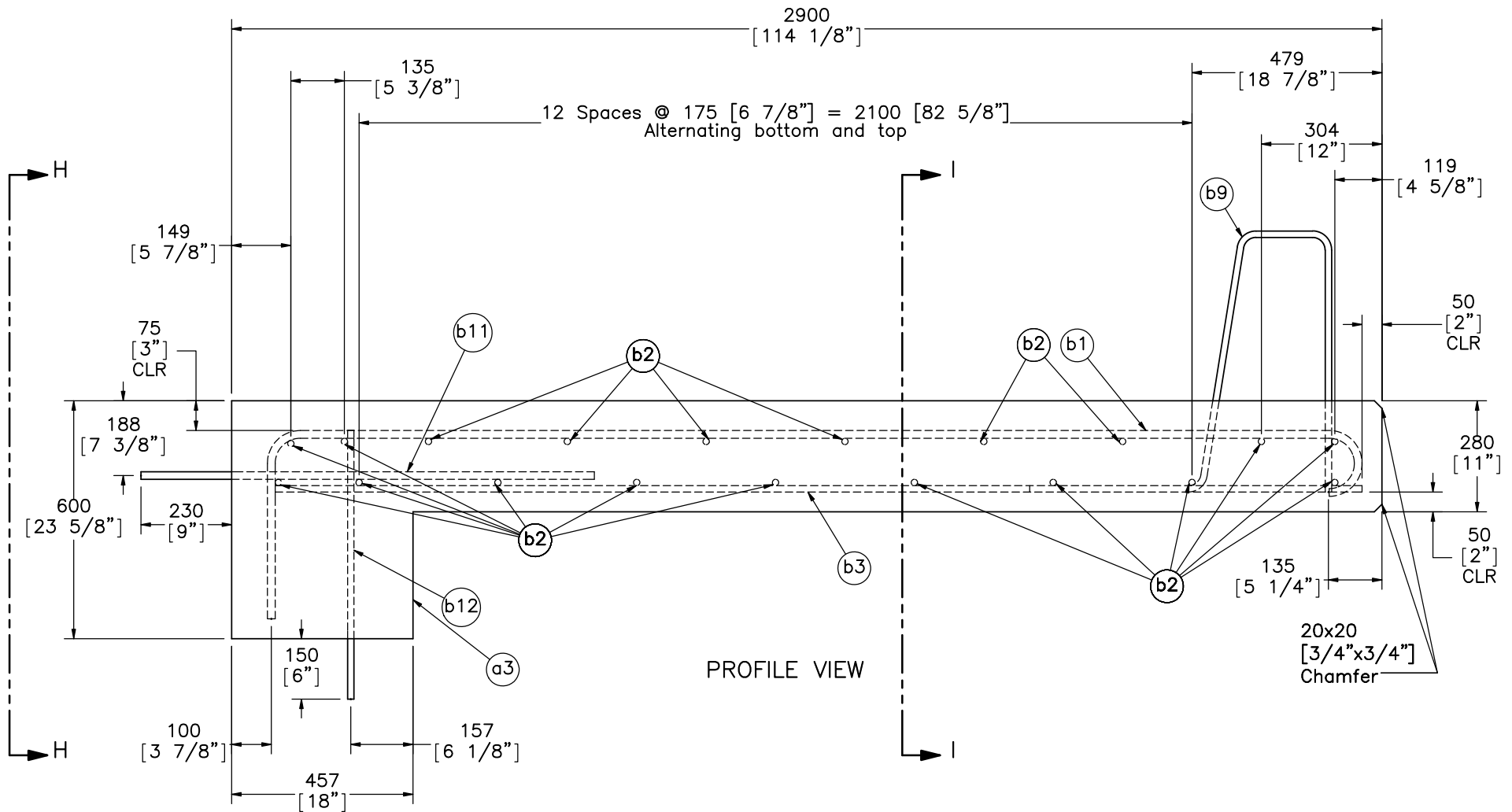
SCALE: 1:23
UNITS: mm[in.]

SHEET:
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DATE:
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DRAWN BY:
JEK

REV. BY:
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Notes: (1) Grade beam not shown.

(2) Reinforcement bars b11 are to be anchored into the existing tarmac with chemical epoxy adhesive (Part e1).

(3) Reinforcement bars b12 are to be driven into soil.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Deck A Detail

DWG. NAME.
Manitoba_R13

SCALE: 1:15
UNITS: mm[in.]

SHEET:
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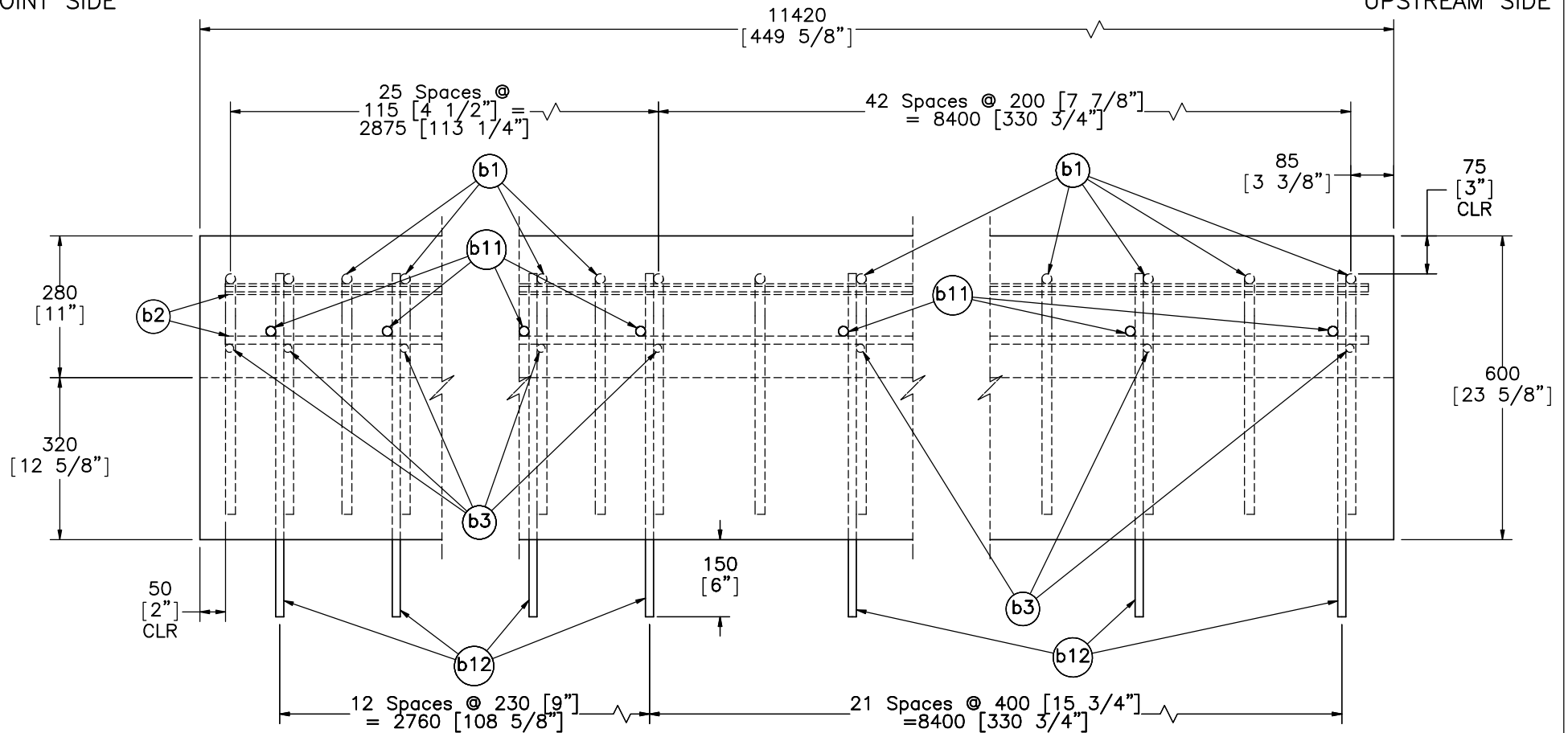
DATE:
4/27/2016

DRAWN BY:
JEK

REV. BY:
SKR/JDS/
KAL/RKF

JOINT SIDE

UPSTREAM SIDE



Notes: (1) Reinforcement bars b3, b11, and b12 are spaced at 230 mm [9"] near the joint and at 400 mm [15 3/4"] elsewhere. Reinforcement bars b1 are spaced at 115 mm [4 1/2"] near the joint and at 200 mm [7 7/8"] elsewhere.

- (2) Reinforcement bars b1 and b3 are on the same vertical plane.
- (3) Reinforcement bars b3 and b11 are tangent to reinforcement bar b12, on opposite sides of the bar.
- (4) Reinforcement bar b2 has a minimum lap splice length of 610 mm [24"].
- (5) Reinforcement in Deck A is the same as Deck B, only mirrored relative to the joint.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Deck A Section

DWG. NAME.
Manitoba_R13

SCALE: 1:12
UNITS: mm[in.]

SHEET:
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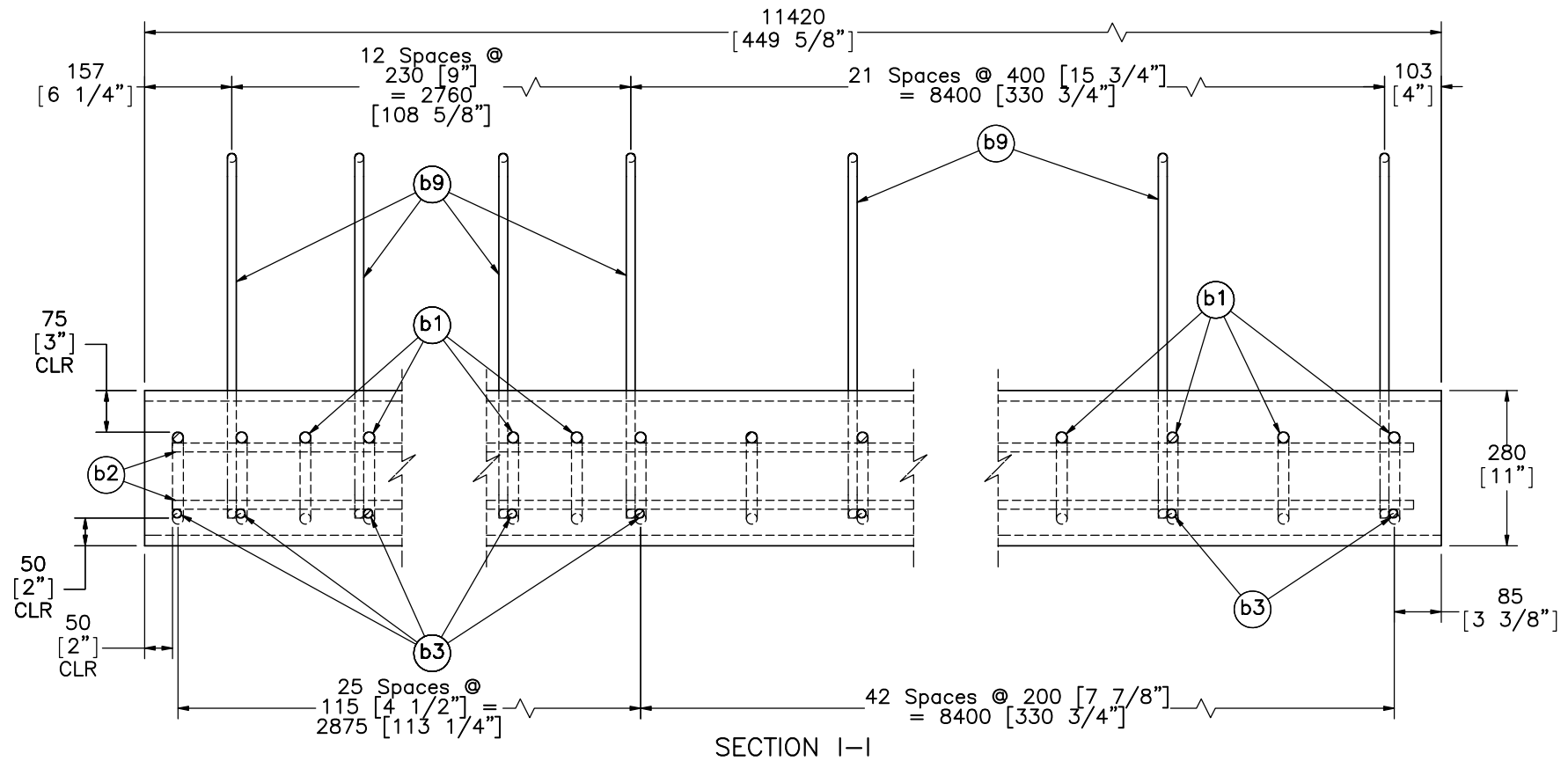
DATE:
4/27/2016

DRAWN BY:
JEK

REV. BY:
SKR/JDS/
KAL/RKF

JOINT SIDE

UPSTREAM SIDE



- Notes:
- (1) Reinforcement bars b3 and b9 are spaced at 230 mm [9"] near the joint and at 400 mm [15 3/4"] elsewhere. Reinforcement bars b1 are spaced at 115 mm [4 1/2"] near the joint and at 200 mm [7 7/8"] elsewhere.
 - (2) Reinforcement bars b1 and b3 are in the same vertical plane and tangent to reinforcement bar b9.
 - (3) No reinforcement bar b9 on the group nearest the joint, due to open gap in the rail.
 - (4) Reinforcement bar b2 has a minimum lap splice length of 610 mm [24"].
 - (5) Reinforcement in Deck A is the same as Deck B, only mirrored relative to the joint.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Deck A Section

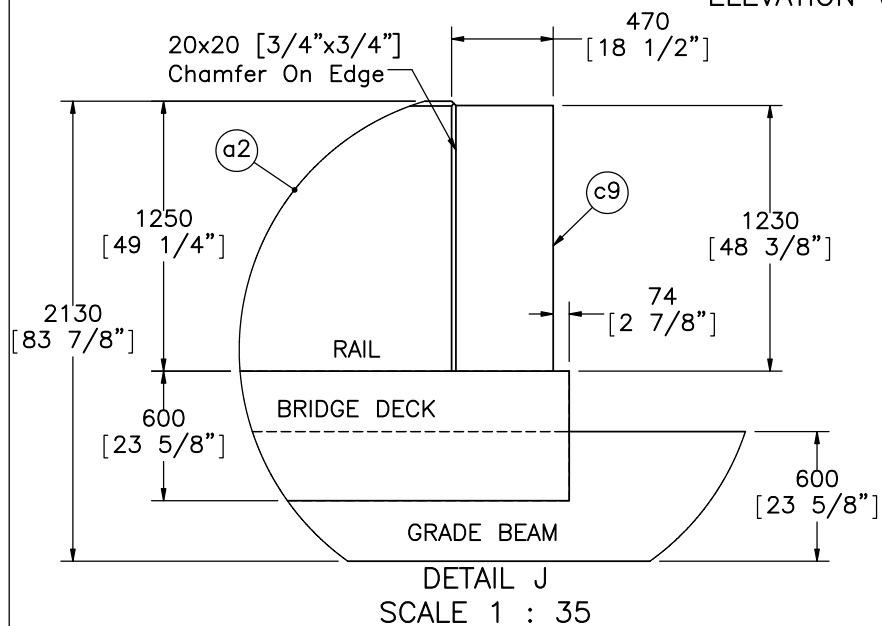
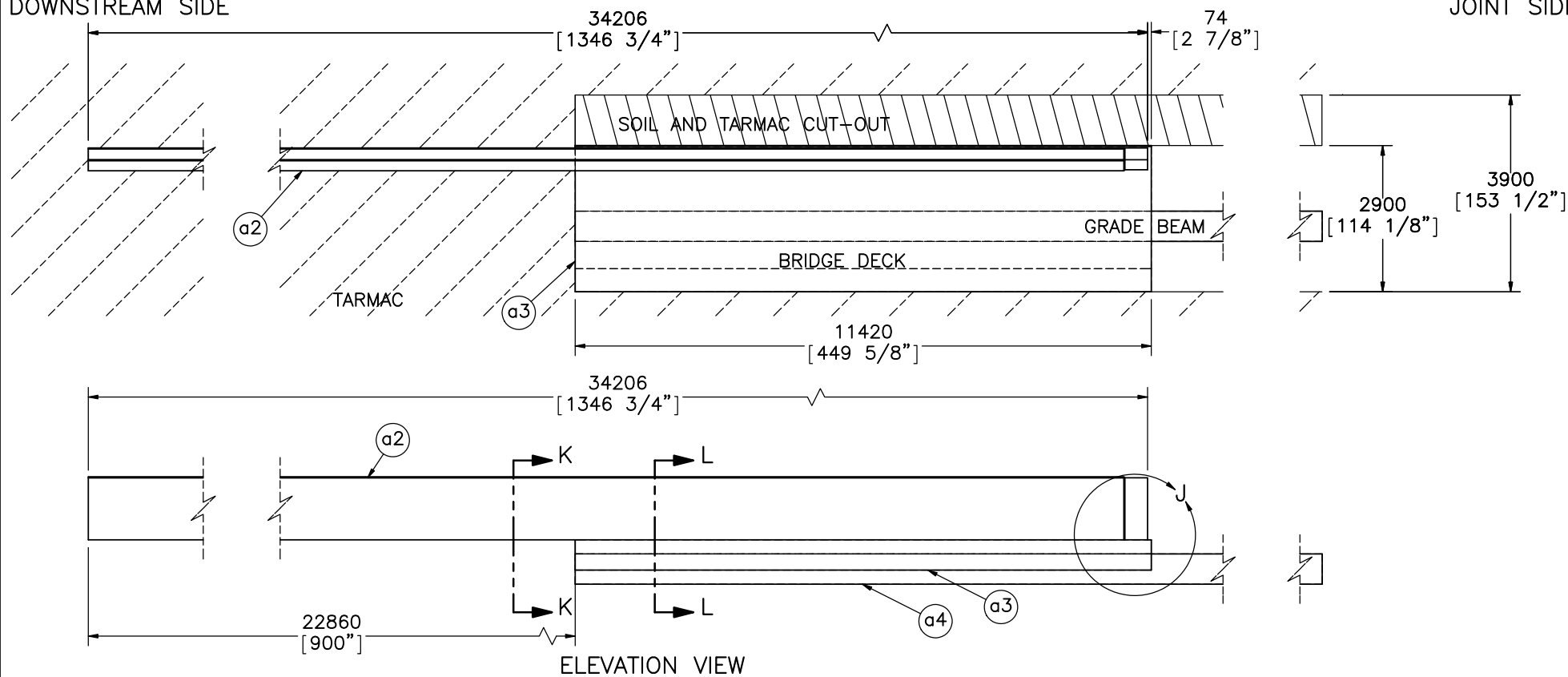
DWG. NAME.
Manitoba_R13

SCALE: 1:12
UNITS: mm[in.]

SHEET:
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DRAWN BY:
JEK
REV. BY:
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KAL/RKF

DOWNSTREAM SIDE

JOINT SIDE



Notes: (1) Internal reinforcement not shown.

(2) The 20 mm [3/4"] recess is longer on the downstream side of the joint to allow for expansion and contraction. A 118 mm [4 5/8"] gap exists between steel cap and full rail cross section.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Deck B and Rail B

DWG. NAME.
Manitoba_R13

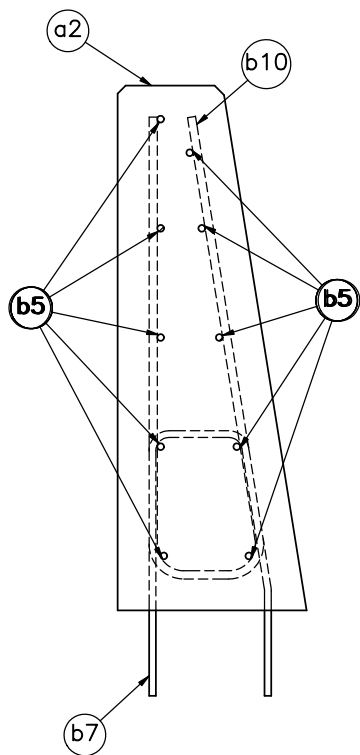
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UNITS: mm[in.]

REV. BY:
SKR/JDS/
KAL/RKF

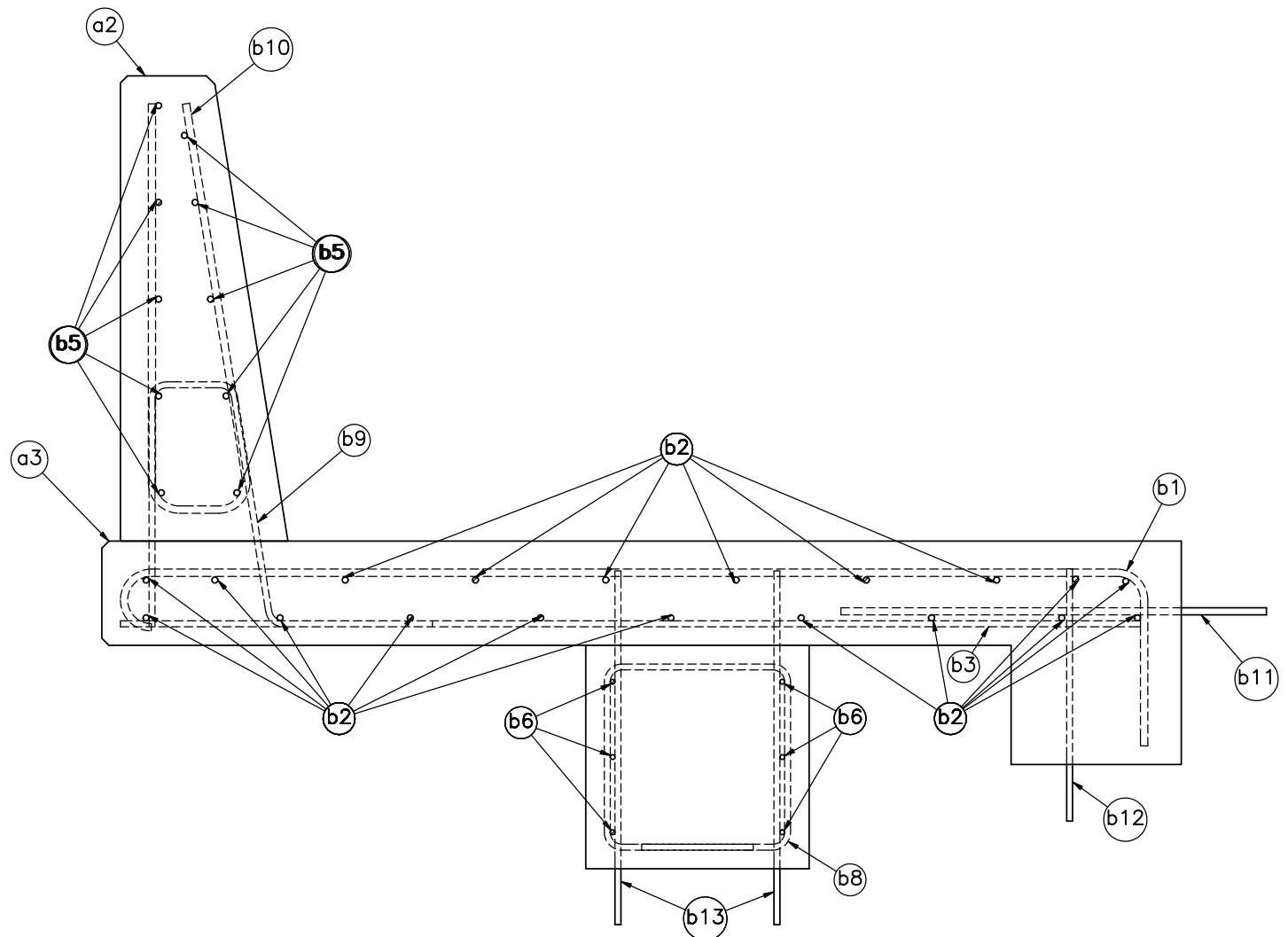
SHEET:
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DRAWN BY:
JEK



SECTION K-K



SECTION L-L

Note: (1) Reinforcement bars b7 and b11 are anchored into the tarmac with chemical epoxy adhesive (Part e1).

(2) Reinforcement bars b12 and b13 are to be driven into soil.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Deck B and Rail B
Sections

DWG. NAME.
Manitoba_R13

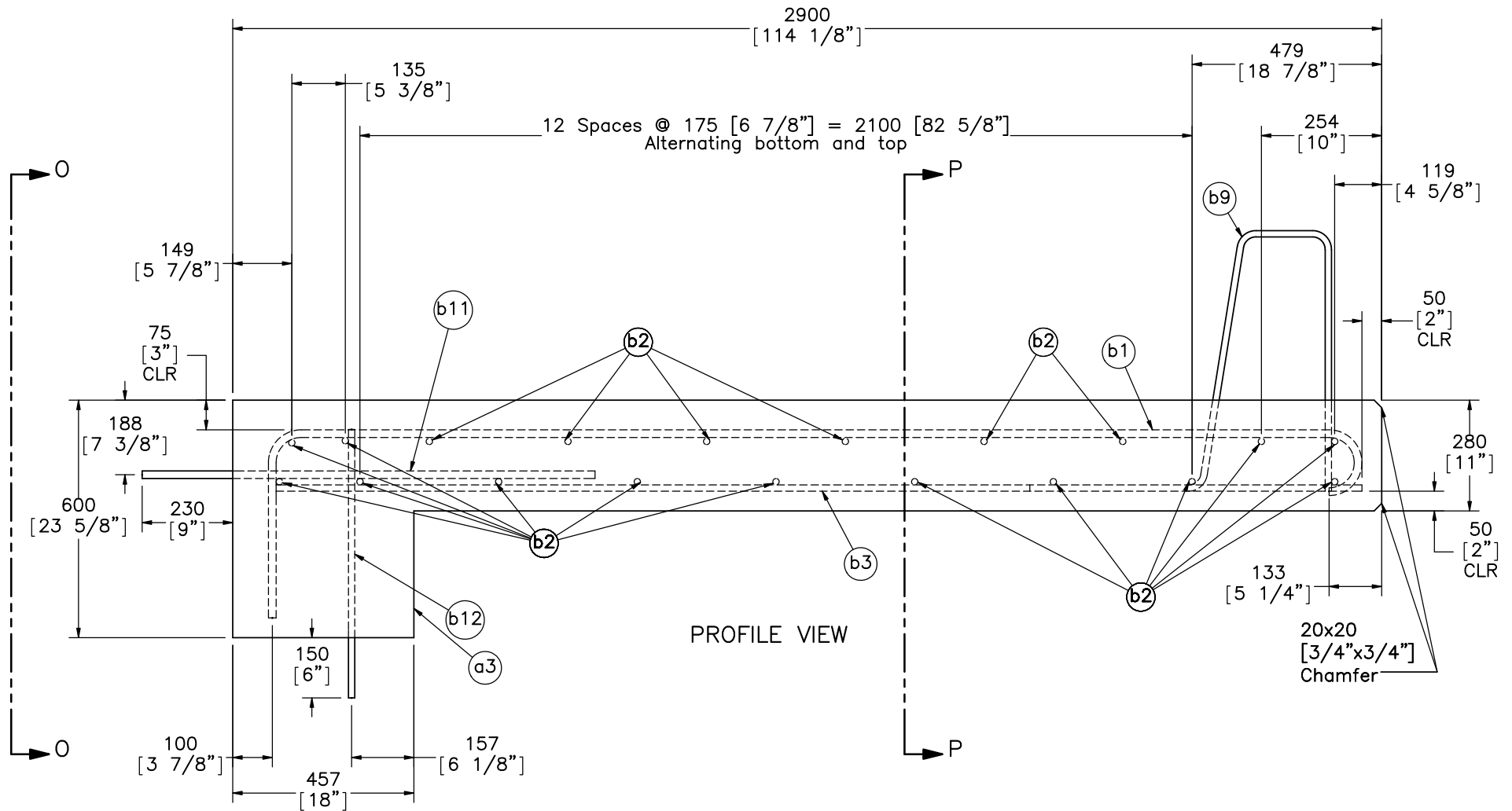
SCALE: 1:18
UNITS: mm[in.]

SHEET:
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DATE:
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DRAWN BY:
JEK

REV. BY:
SKR/JDS/
KAL/RKF



Notes: (1) Grade beam not shown.

(2) Reinforcement bars b11 are to be anchored into the existing tarmac with chemical epoxy adhesive (Part e1).

(3) Reinforcement bars b12 are to be driven into soil.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Deck B Detail

DWG. NAME.
Manitoba_R13

SCALE: 1:15
UNITS: mm[in.]

SHEET:
13 of 24

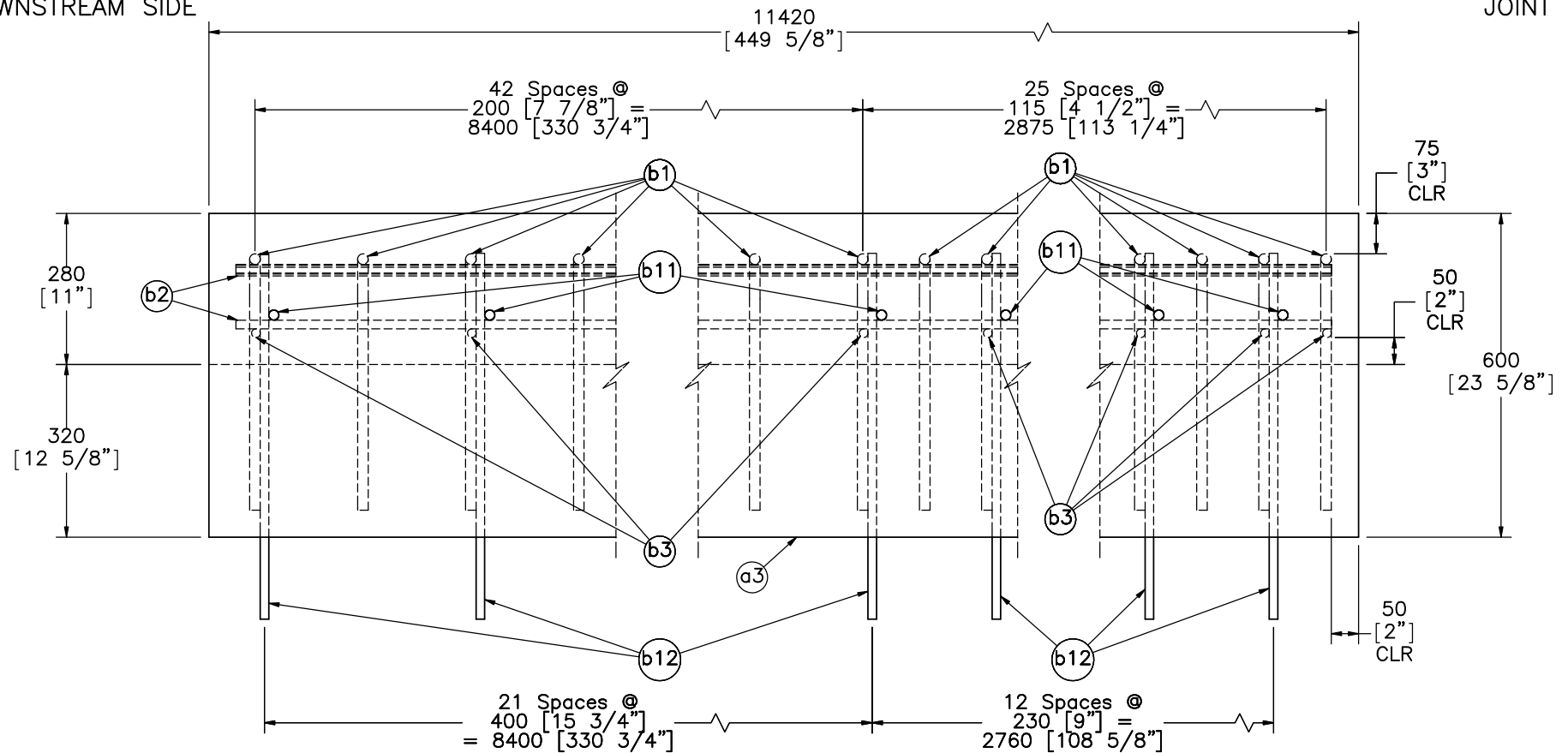
DATE:
4/27/2016

DRAWN BY:
JEK

REV. BY:
SKR/JDS/
KAL/RKF

DOWNSTREAM SIDE

JOINT SIDE



SECTION O-O
Section Depth: 1.5 m [59"]

Notes: (1) Reinforcement bars b3, b11, and b12 are spaced at 230 mm [9"] near the joint and at 400 mm [15 3/4"] elsewhere. Reinforcement bar b1 is spaced at 115 mm [4 1/2"] near the joint and at 200 mm [7 7/8"] elsewhere.

- (2) Reinforcement bars b1 and b3 are on the same vertical plane.
- (3) Reinforcement bars b3 and b11 are tangent to reinforcement bar b12, on opposite sides of the bar.
- (4) Reinforcement bar b2 has a minimum lap splice length of 610 mm [24"].
- (5) Reinforcement in Deck B is the same as Deck A, only mirrored relative to the joint.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Deck B Section

DWG. NAME:
Manitoba_R13

SCALE: 1:12
UNITS: mm[in.]

SHEET:
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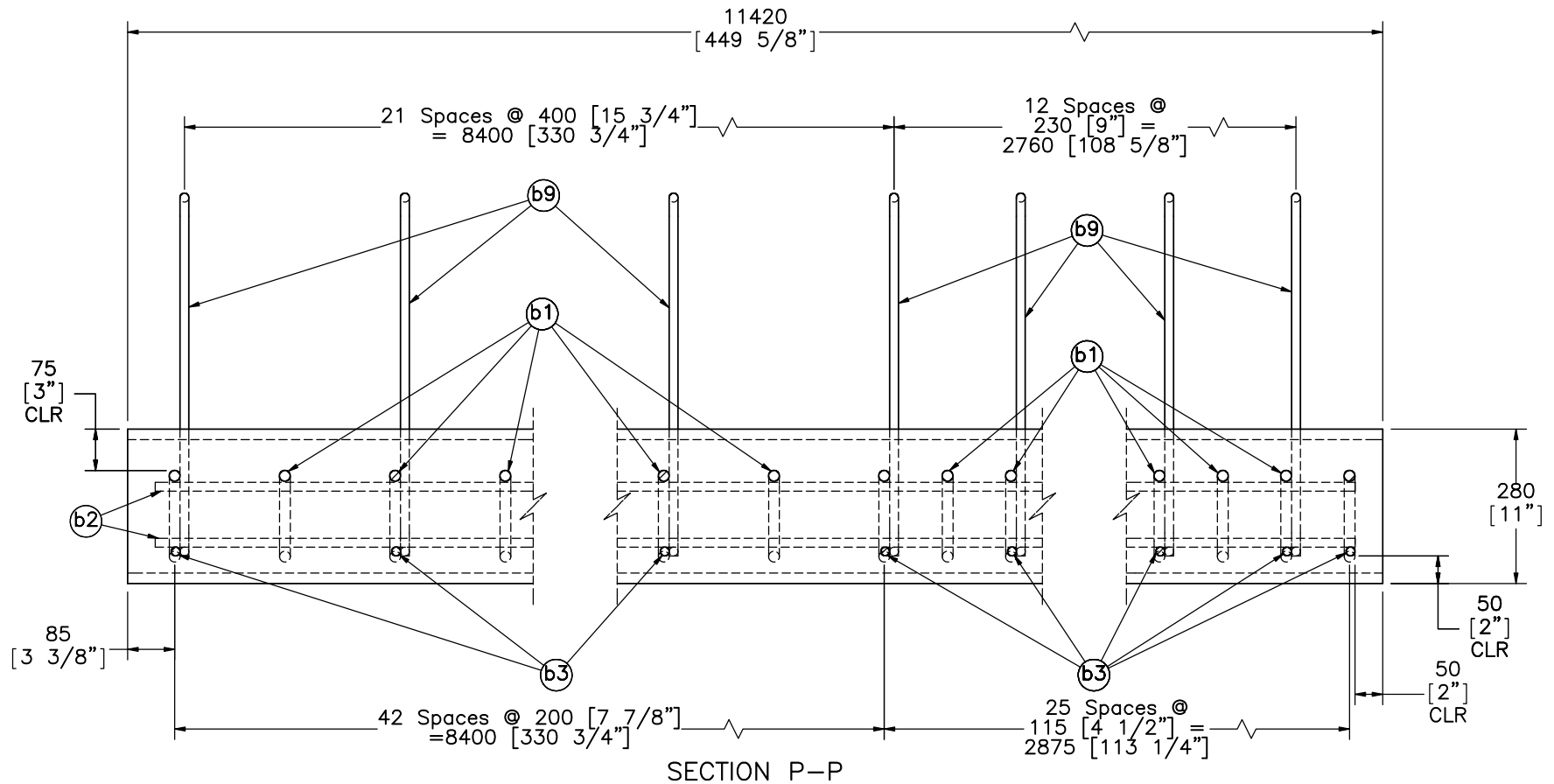
DATE:
4/27/2016

DRAWN BY:
JEK

REV. BY:
SKR/JDS/
KAL/RKF

DOWNSTREAM SIDE

JOINT SIDE



- Notes:
- (1) Reinforcement bars b3 and b9 are spaced at 230 mm [9"] near the joint and at 400 mm [15 3/4"] elsewhere. Reinforcement bar b1 is spaced at 115 mm [4 1/2"] near the joint and at 200 mm [7 7/8"] elsewhere.
 - (2) Reinforcement bars b1 and b3 are in the same vertical plane and tangent to reinforcement bar b9.
 - (3) No reinforcement bar b9 on the group nearest the joint, due to open joint in the rail.
 - (4) Reinforcement bar b2 has a minimum lap splice length of 610 mm [24"].
 - (5) Reinforcement in Deck B is the same as Deck A, only mirrored relative to the joint.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Bridge Deck B Section

DWG. NAME.
Manitoba_R13

SCALE: 1:12
UNITS: mm[in.]

SHEET:
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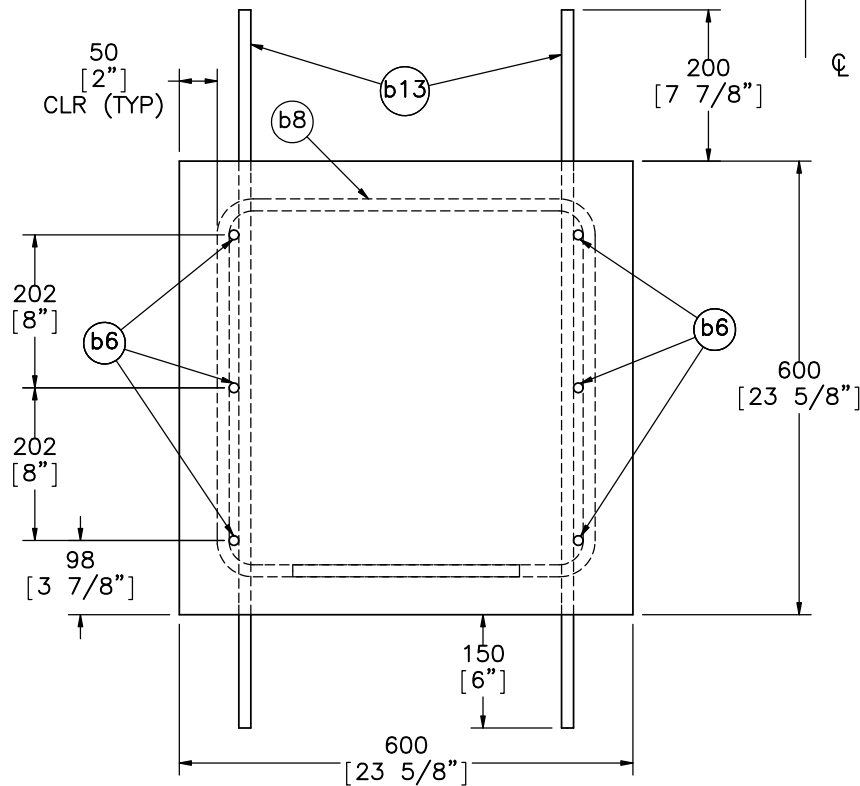
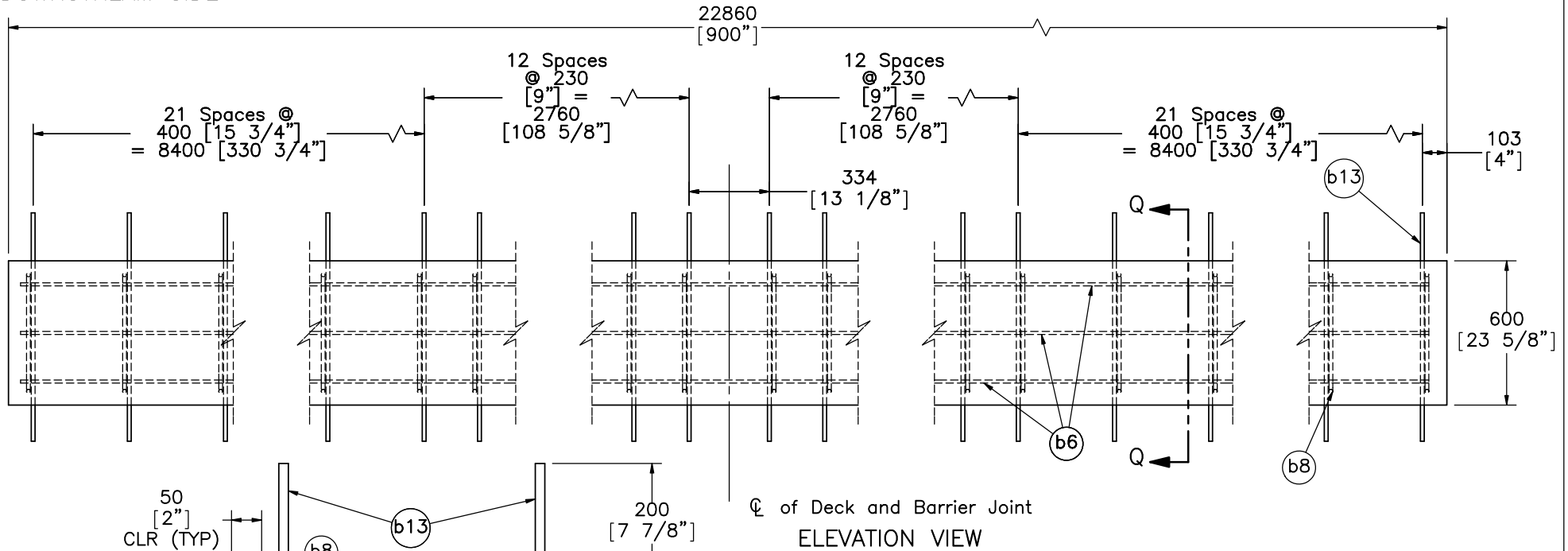
DATE:
4/27/2016

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JEK

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DOWNSTREAM SIDE

UPSTREAM SIDE



Notes: (1) Reinforcement bars b13 are to be driven into soil.

(2) Reinforcement bar b6 has a minimum lap splice length of 457 mm [18"].



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Grade Beam Detail

DWG. NAME.
Manitoba_R13

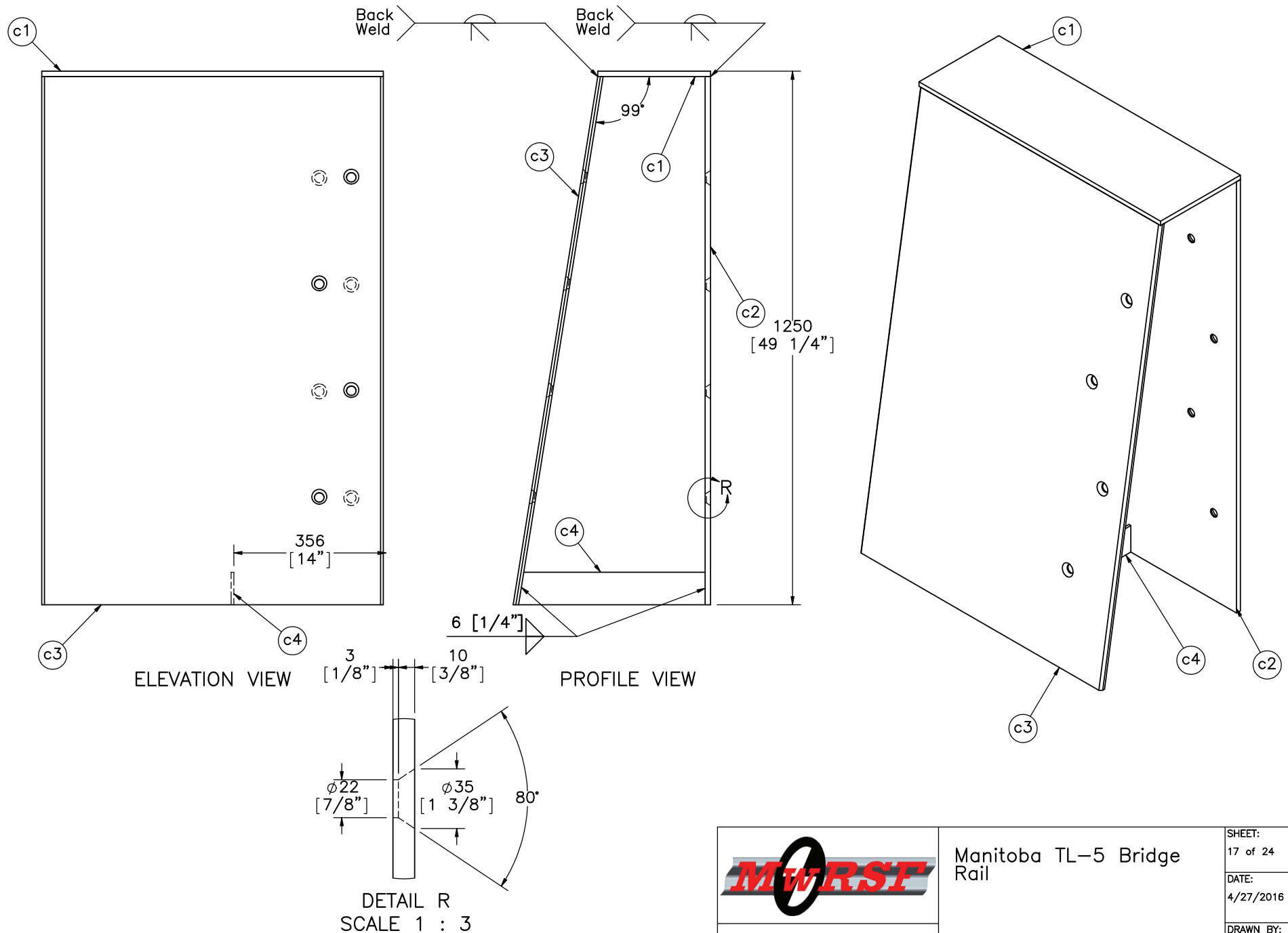
SCALE: 1:25
UNITS: mm[in.]

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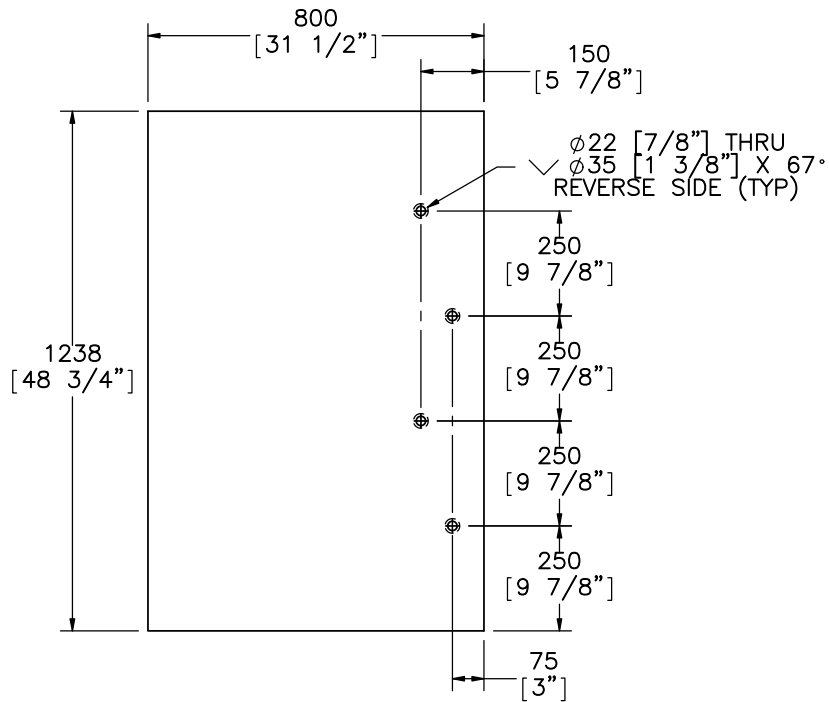
DRAWN BY:
JEK

REV. BY:
SKR/JDS/
KAL/RKF

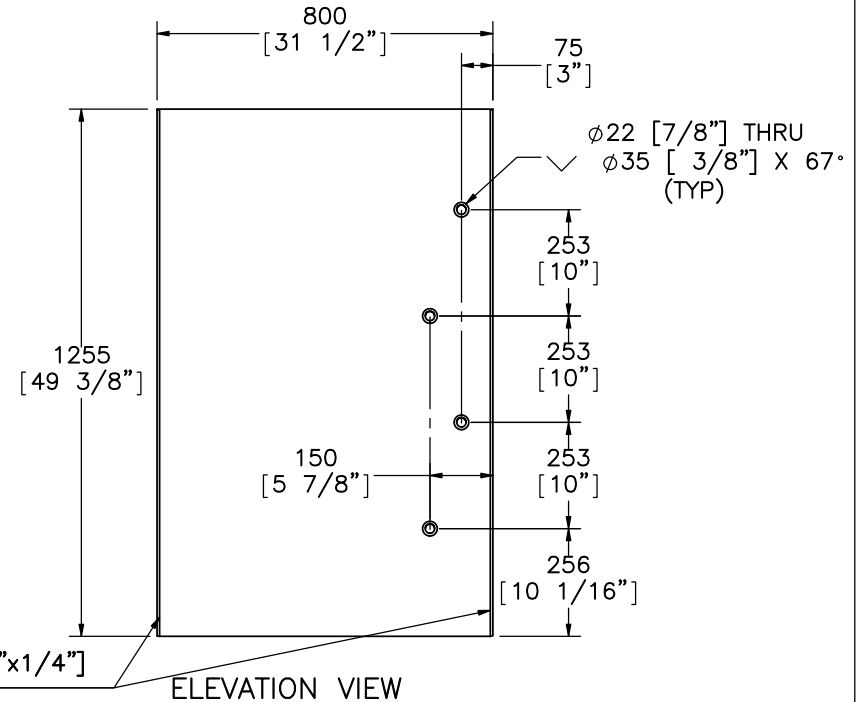


Note: (1) Both the upstream and downstream edgest of the joint cap's front plate (Part c3) are chamfered 6x6 [1/4"x1/4"].

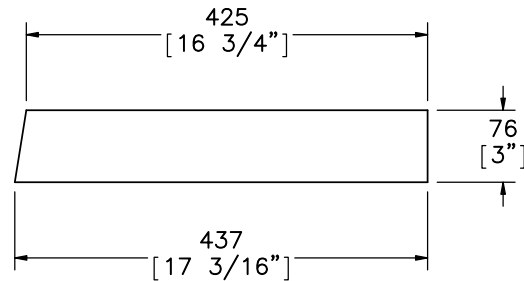
	Manitoba TL-5 Bridge Rail		SHEET: 17 of 24
	Rail Joint Cap		DATE: 4/27/2016
Midwest Roadside Safety Facility	DWG. NAME: Manitoba_R13		DRAWN BY: JEK
	SCALE: 1:12 UNITS: mm[in.]		REV. BY: SKR/JDS/ KAL/RKF



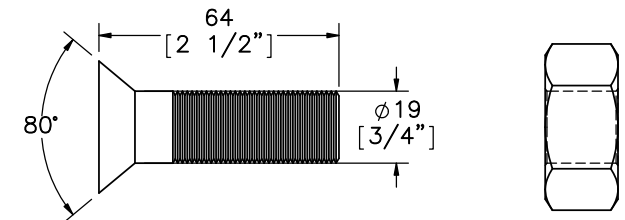
ELEVATION VIEW
Part c2
13 [1/2"] THICKNESS



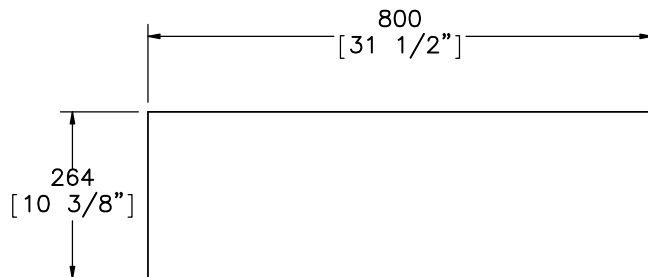
ELEVATION VIEW
Part c3
13 [1/2"] THICKNESS



PROFILE VIEW
Part c4
6 [1/4"] THICKNESS
SCALE 1:8



∅19x64 [∅3/4"x2 1/2"]
FLAT HEAD COUNTERSUNK BOLT
SCALE 1:2



PLAN VIEW
Part c1
13 [1/2"] THICKNESS
SCALE 1:12



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Rail Joint Cap Component
Detail

DWG. NAME:
Manitoba_R13

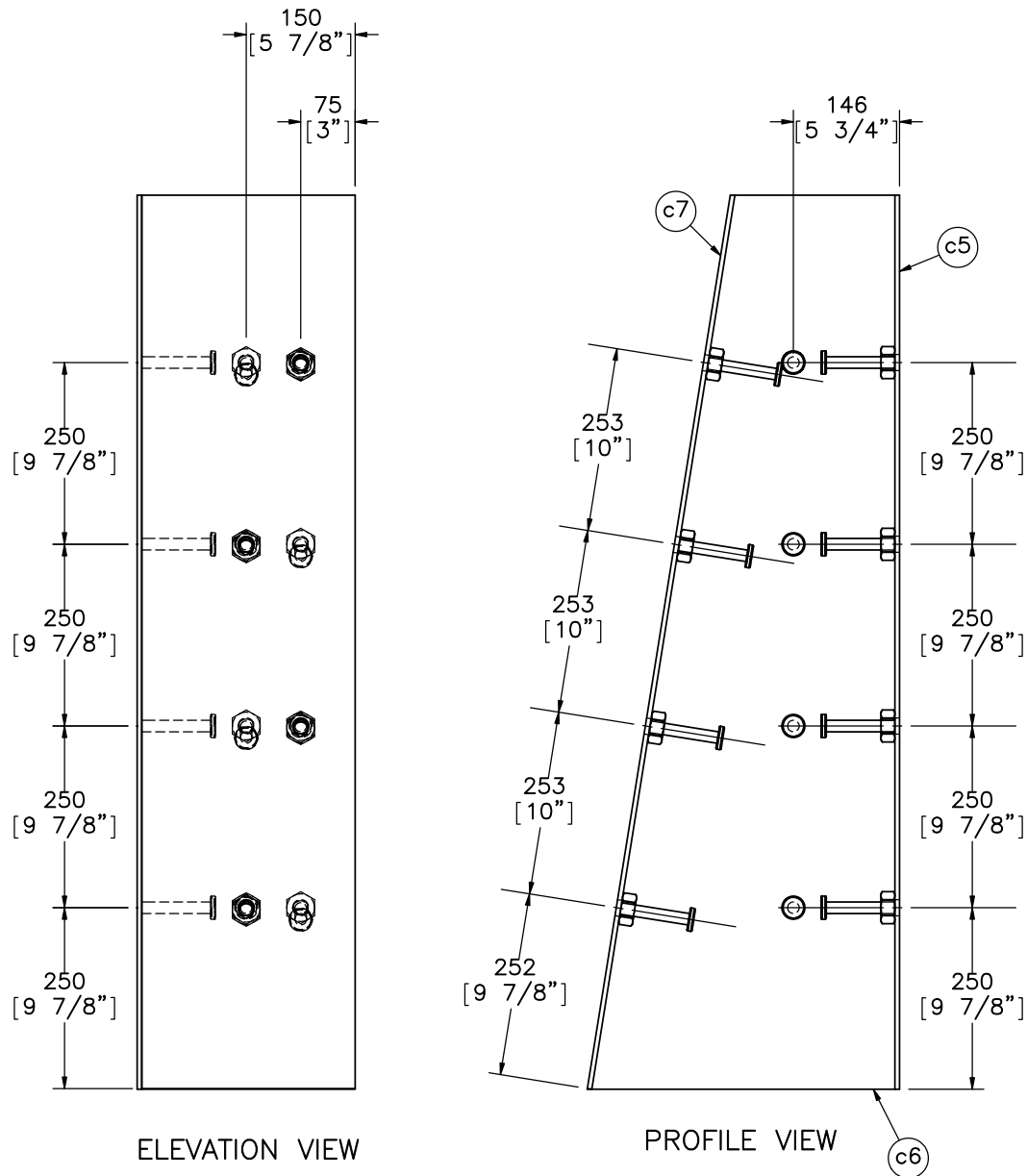
SCALE: 1:18
UNITS: mm[in.]

SHEET:
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DATE:
4/27/2016

DRAWN BY:
JEK

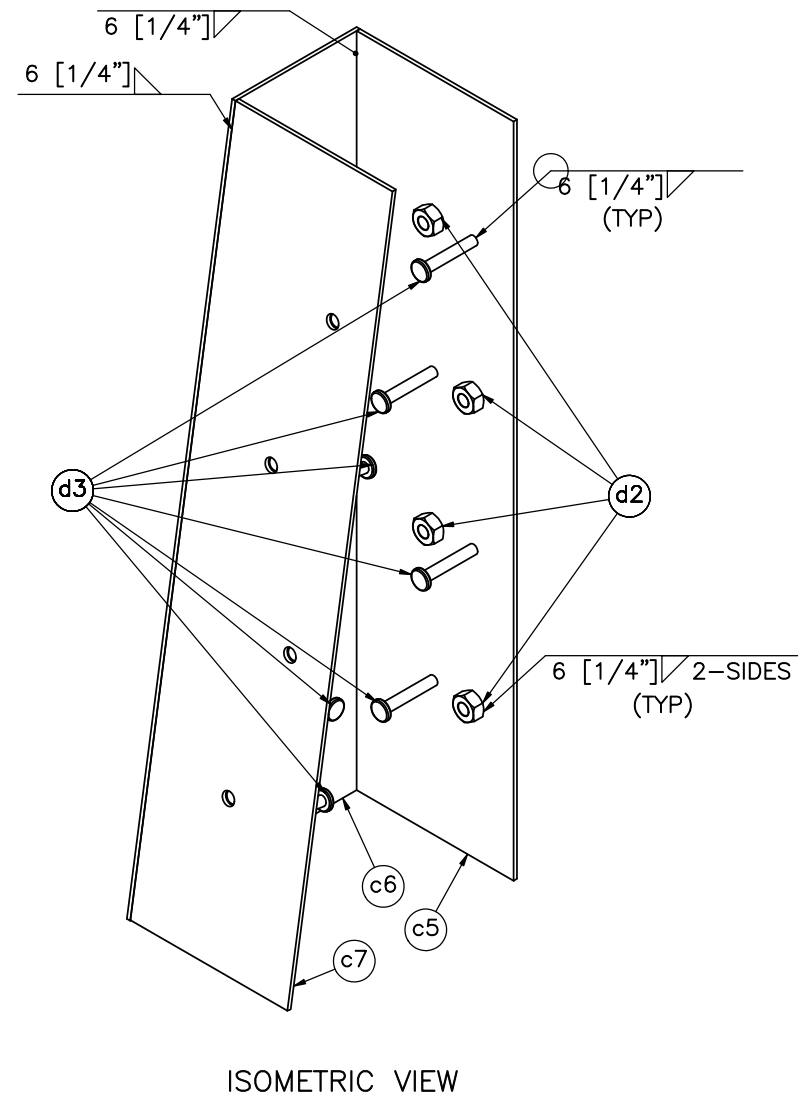
REV. BY:
SKR/JDS/
KAL/RKF



ELEVATION VIEW

PROFILE VIEW

- Note: (1) All nuts (part d2) and studs (part d3) are to be fillet welded onto the plate surface, with nuts placed at hole locations.
- (2) The placement of the studs and nuts follow an alternating pattern on the front and back plates.
- (3) When casting the rail, the anchor bolts (Part d1) should be greased and installed through holes/nuts. After curing, remove bolts, position joint cap, and re-install bolts.



Midwest Roadside
Safety Facility

Manitoba TL-5 Bridge
Rail

Upstream Barrier End Cap

DWG. NAME.
Manitoba_R13

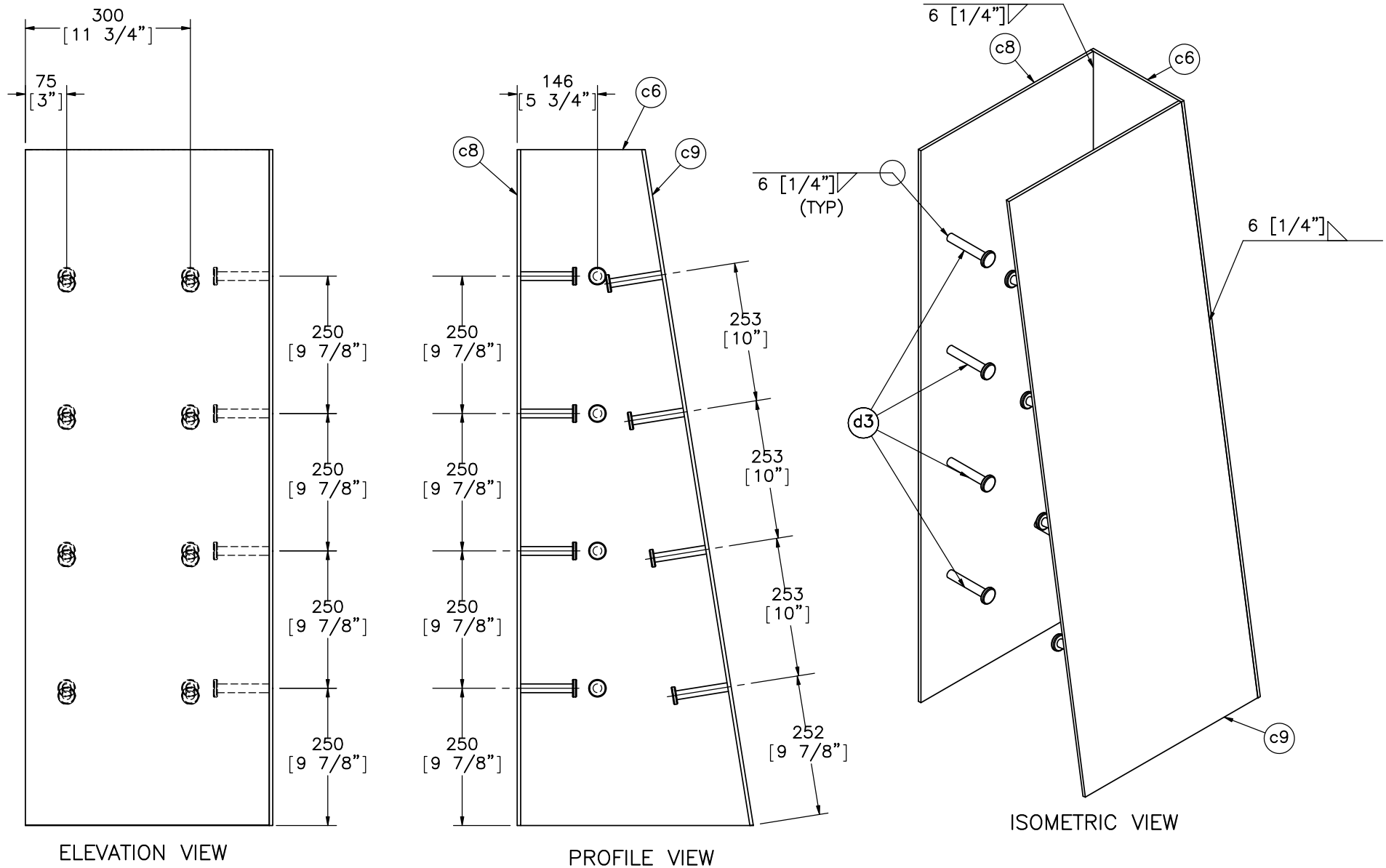
SCALE: 1:10
UNITS: mm[in.]

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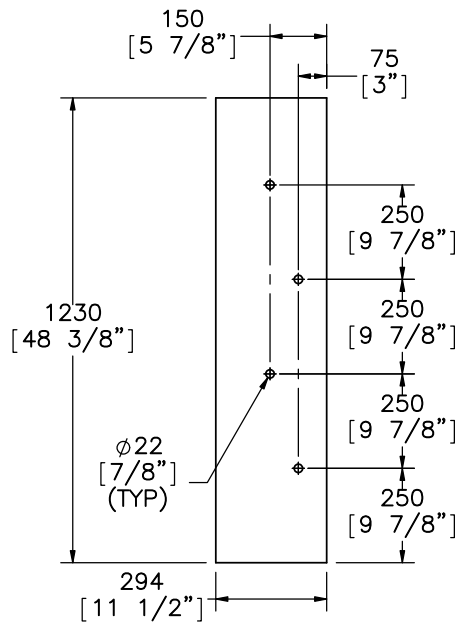
DRAWN BY:
JEK

REV. BY:
SKR/JDS/
KAL/RKF

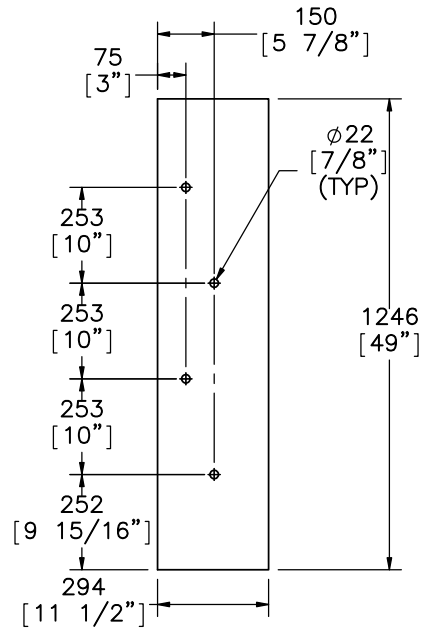


Note: (1) All studs (part d3) are to be fillet welded onto the plate surface.

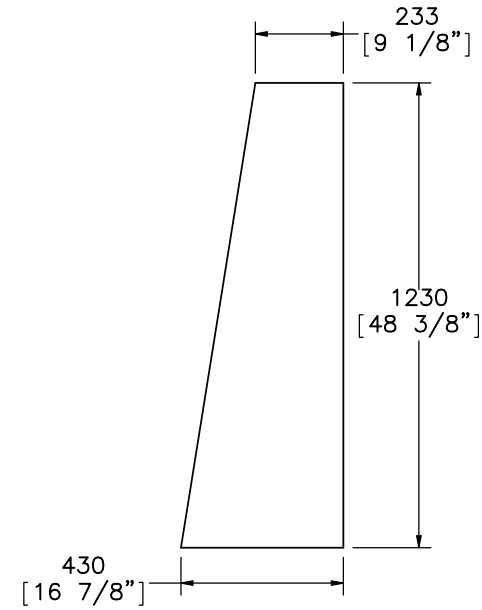
	Manitoba TL-5 Bridge Rail		SHEET: 20 of 24
	Downstream Barrier End Cap		DATE: 4/27/2016
Midwest Roadside Safety Facility	DWG. NAME: Manitoba_R13		DRAWN BY: JEK
	SCALE: 1:10 UNITS: mm[in.]		REV. BY: SKR/JDS/KAL/RKF



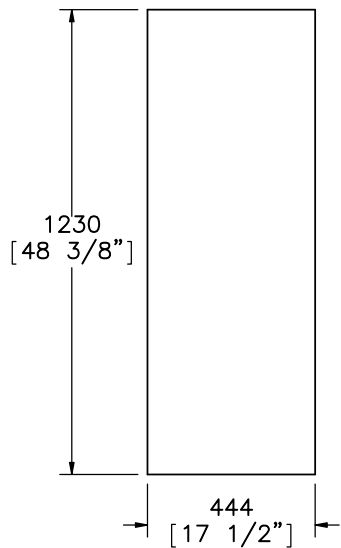
ELEVATION VIEW
Part c5
6 [1/4"] THICKNESS



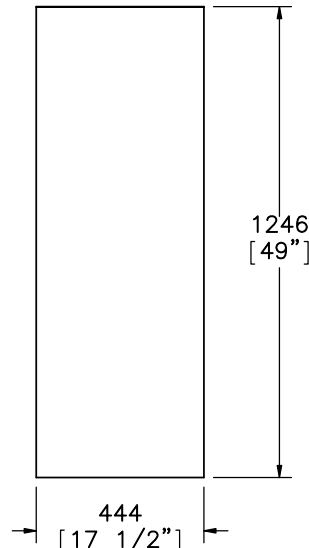
ELEVATION VIEW
BACK SIDE
Part c7
6 [1/4"] THICKNESS



PROFILE VIEW
Part c6
6 [1/4"] THICKNESS



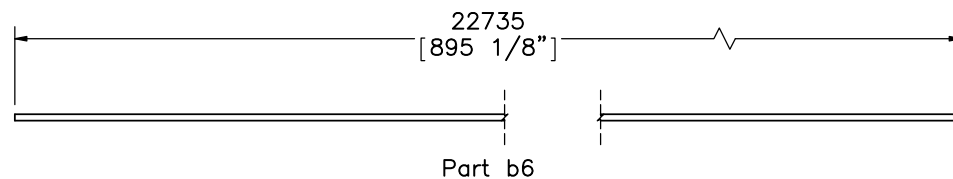
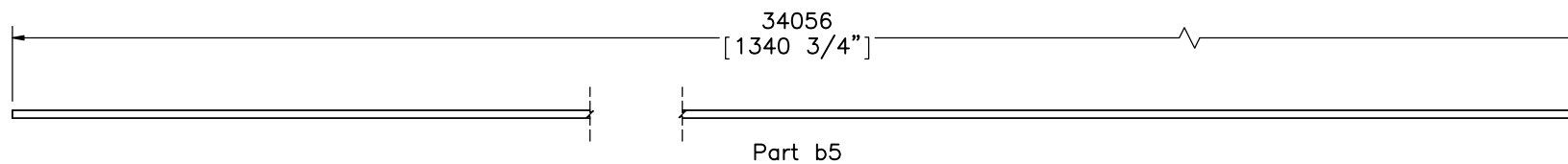
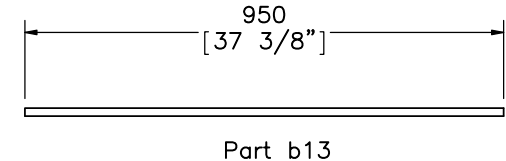
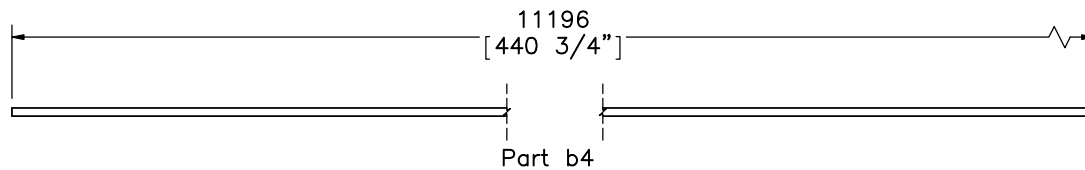
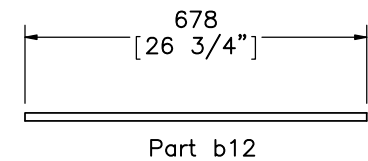
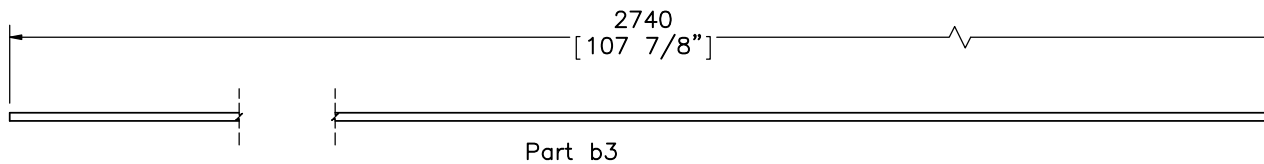
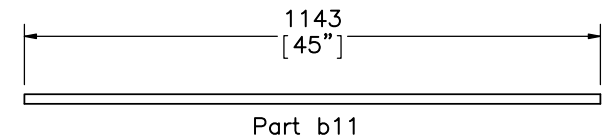
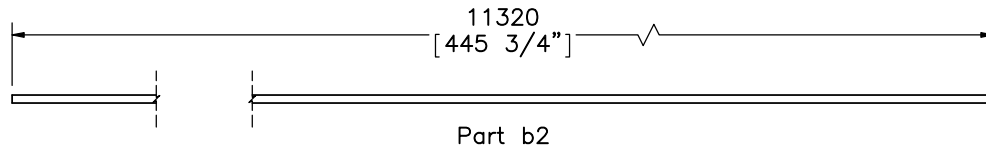
ELEVATION VIEW
Part c8
6 [1/4"] THICKNESS



ELEVATION VIEW
BACK SIDE
Part c9
6 [1/4"] THICKNESS

	Manitoba TL-5 Bridge Rail		SHEET: 21 of 24
	Barrier End Cap Components		DATE: 4/27/2016
Midwest Roadside Safety Facility	DWG. NAME: Manitoba_R13		DRAWN BY: JEK
	SCALE: 1:20 UNITS: mm[in.]		REV. BY: SKR/JDS/ KAL/RKF

Bill of Bars					
Bar	QTY	Size	Total Length	Location	Material
b2	38	M15	11.32 m [445 3/4"], Minimum Lap Length 610 [24"]	Bridge Deck A & B, Longitudinal	Steel Grade 400W
b3	70	M15	2.74 m [107 7/8"]	Bridge Deck A & B, Lateral	Steel Grade 400W
b4	10	M15	11.196 m [440 3/4"], Minimum Lap Length 610 [24"]	Rail A, Longitudinal	Steel Grade 400W
b5	10	M15	34.056 m [1340 3/4"], Minimum Lap Length 610 [24"]	Rail B, Longitudinal	Steel Grade 400W
b6	6	#4	22.735 m [895 1/8"], Minimum Lap Length 457 [18"]	Grade Beam, Longitudinal	ASTM A615 Gr. 60
b11	68	#6	1.143 m [45"]	Deck A & B, to Tarmac	ASTM A615 Gr. 60
b12	68	#5	0.678 m [26 3/4"]	Deck A & B, to Soil	ASTM A615 Gr. 60
b13	136	#5	0.95 m [37 3/8"]	Grade Beam, Vertical	ASTM A615 Gr. 60



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Manitoba TL-5 Bridge
Rail

Rebar Detail

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Manitoba_R13

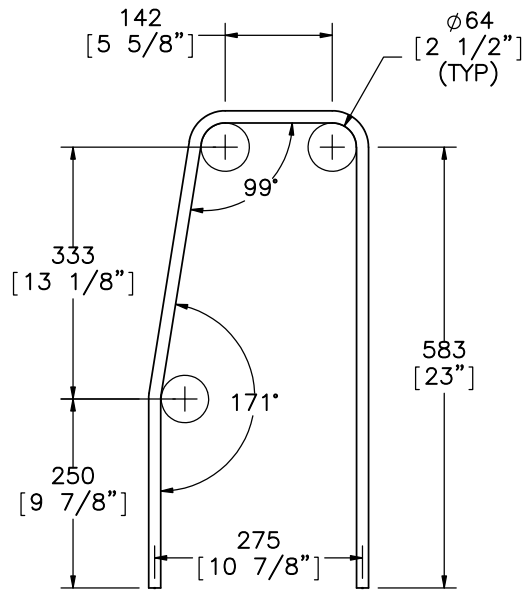
SCALE: 1:15
UNITS: mm[in.]

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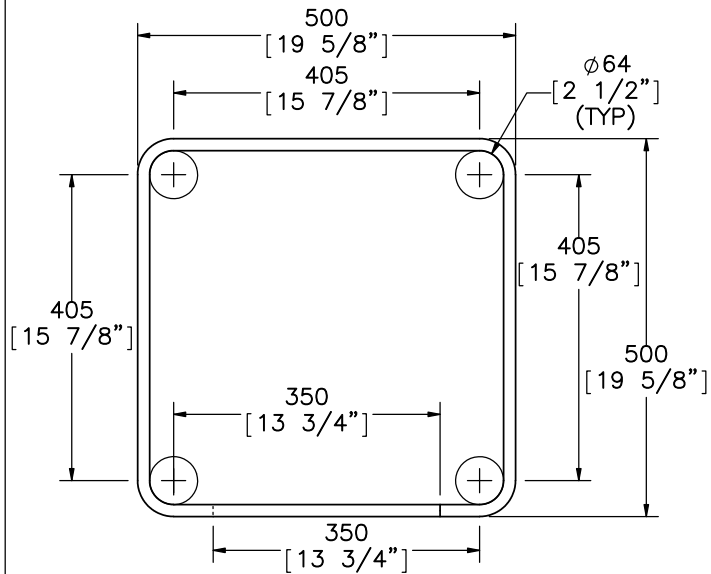
DATE:
4/27/2016

DRAWN BY:
JEK

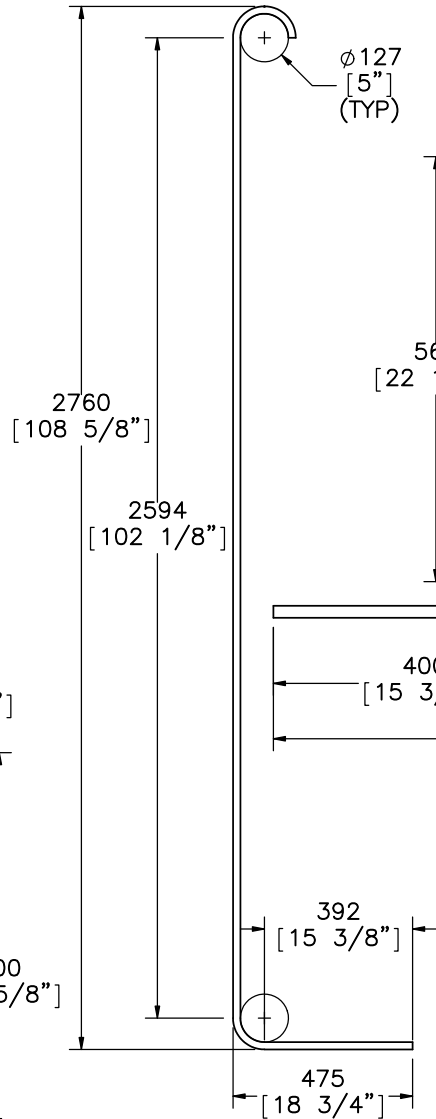
REV. BY:
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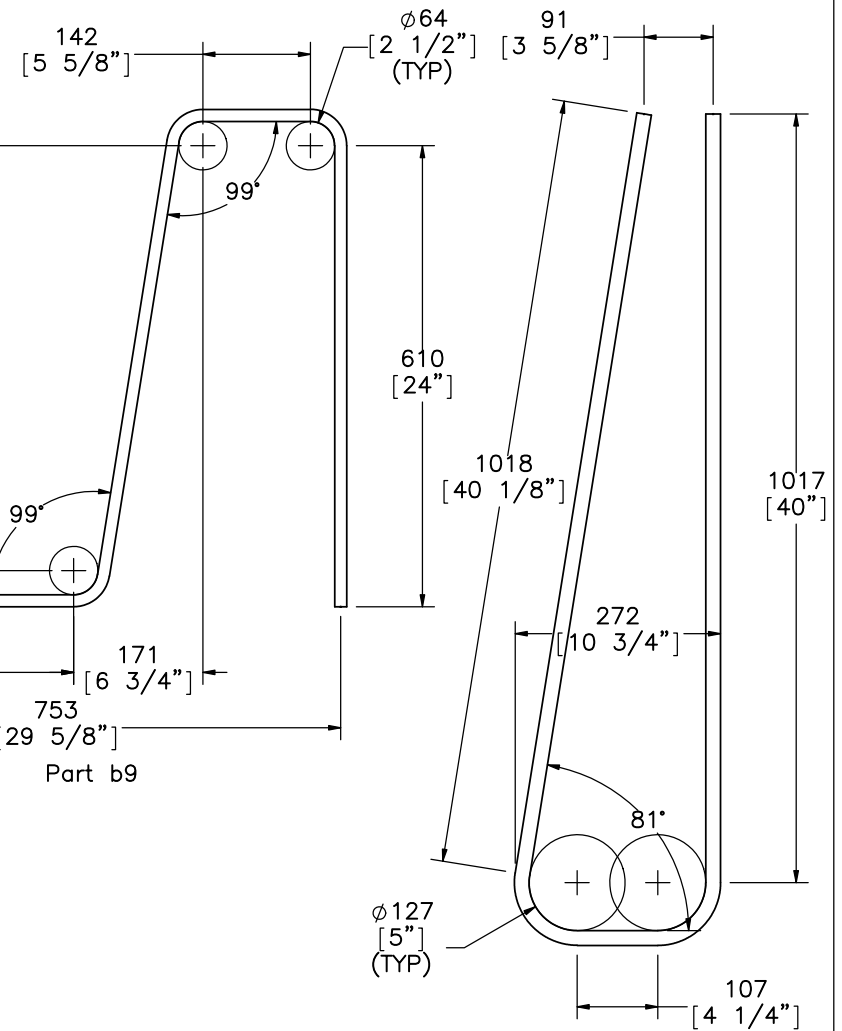
Part b7



Part b8



Part b1
SCALE 1:20



Part b10

Bill of Bars

Bar	QTY	Size	Total Length	Location	Material
b1	136	M20	3.332 m [131 1/4"]	Bridge Deck A & B	Steel Grade 400W
b7	57	M15	1.438 m [56 5/8"]	Bridge Rail B	Steel Grade 400W
b8	68	#5	2.166 m [85 1/4"]	Grade Beam	ASTM A615 Gr. 60
b9	68	M15	1.897 m [74 5/8"]	Bridge Deck A & B	Steel Grade 400W
b10	125	M20	2.384 m [93 7/8"]	Bridge Rail A & B	Steel Grade 400W



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Rebar Detail

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Item No.	QTY.	Description	Material Spec	Hardware Guide
a1	1	Bridge Rail Concrete 1 – 4.96 cubic meters [175.16 cubic ft]	Min. f'c = 45 MPa [6,527 psi]	—
a2	1	Bridge Rail Concrete 2 – 17.97 cubic meters [634.60 cubic ft]	Min. f'c = 45 MPa [6,527 psi]	—
a3	2	Bridge Deck Concrete Fill – 10.73 cubic meters [387.40 cubic ft]	Min. f'c = 45 MPa [6,527 psi]	—
a4	1	Grade Beam Concrete Fill – 8.23 cubic meters [290.64 cubic ft]	Min. f'c = 45 MPa [6,527 psi]	—
b1	136	M20 Bar – 3.332 m [131 1/4"] Long, Bent, Bridge Deck A & B	Steel Grade 400W	—
b2	38	M15 Bar – 11.320 m [445 3/4"] Long, Bridge Deck A & B	Steel Grade 400W	—
b3	70	M15 Bar – 2.740 m [107 7/8"] Long, Bridge Deck A & B	Steel Grade 400W	—
b4	10	M15 Bar – 11.196 m [440 3/4"] Long, Bridge Rail A	Steel Grade 400W	—
b5	10	M15 Bar – 34.056 m [1340 3/4"] Long, Bridge Rail B	Steel Grade 400W	—
b6	6	#4 Bar – 22.735 m [895 1/8"] Long, Grade Beam	ASTM A615 Gr. 60	—
b7	57	M15 Bar – 1.438 m [56 5/8"] Long, Bent, Bridge Rail B	Steel Grade 400W	—
b8	68	#5 Bar – 2.166 m [85 1/4"] Long, Bent, Grade Beam	ASTM A615 Gr. 60	—
b9	68	M15 Bar – 1.897 m [74 5/8"] Long, Bent, Bridge Deck A & B	Steel Grade 400W	—
b10	125	M20 Bar – 2.384 m [93 7/8"] Long, Bent, Bridge Rail A & B	Steel Grade 400W	—
b11	68	#6 Bar – 1.143 m [45"] Long, Bridge Deck A & B	ASTM A615 Gr. 60	—
b12	68	#5 Bar – 0.678 m [26 3/4"] Long, Bridge Deck A & B	ASTM A615 Gr. 60	—
b13	136	#5 Bar – 0.950 m [37 3/8"] Long, Grade Beam	ASTM A615 Gr. 60	—
c1	1	800x264x13 [31 1/2"x10 3/8"x1/2"] Plate	ASTM A572	—
c2	1	1238x800x13 [48 3/4"x31 1/2"x1/2"] Plate	ASTM A572	—
c3	1	1255x800x13 [49 7/16"x31 1/2"x1/2"] Plate	ASTM A572	—
c4	1	386x76x6 [15 3/16"x3"x1/4"] Plate	ASTM A572	—
c5	1	1230x294x6 [48 3/8"x11 5/8"x1/4"] Plate	ASTM A572	—
c6	2	1230x430x6 [48 3/8"x16 7/8"x1/4"] Plate	ASTM A572	—
c7	1	1246x294x6 [49"x11 5/8"x1/4"] Plate	ASTM A572	—
c8	1	1230x444x6 [48 3/8"x17 1/2"x1/4"] Plate	ASTM A572	—
c9	1	1246x444x6 [49"x17 1/2"x1/4"] Plate	ASTM A572	—
d1	8	3/4" [19] Dia. 2–1/2" [64] Long Flat Head Countersunk Bolt	F835	—
d2	8	3/4" [19] Dia. Hex Nut	A563	—
d3	32	5/8" [16] Dia. x 4" [102] Long Stud	Steel Any Grade	—
e1	1	Chemical Epoxy Adhesive	Min. Bond Strength = 10 MPa [1,450 psi]	—



Midwest Roadside
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Bill of Materials

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12	1/21/2016	6	Clear cover note added.	SKR	JEK
		7	Deck A lower portion width changed to 18".		
		8	Part b12 rebar dimension moved to include center spacing. Edited as such.		
		12	Clear cover note added. Dimension to bar b7 added. Rail B bottom bar b5 spacing changed to 130 mm, to match Rail A. Dimension and note shift.		
		13	Deck B lower portion width changed to 18".		
		14	Dimension spacing number corrected.		
		15	Dimension spacing number corrected.		
		24	Part d1 material specification change.		
13	4/27/2016	24	English conversion of concrete volumes corrected.	SKR	JEK