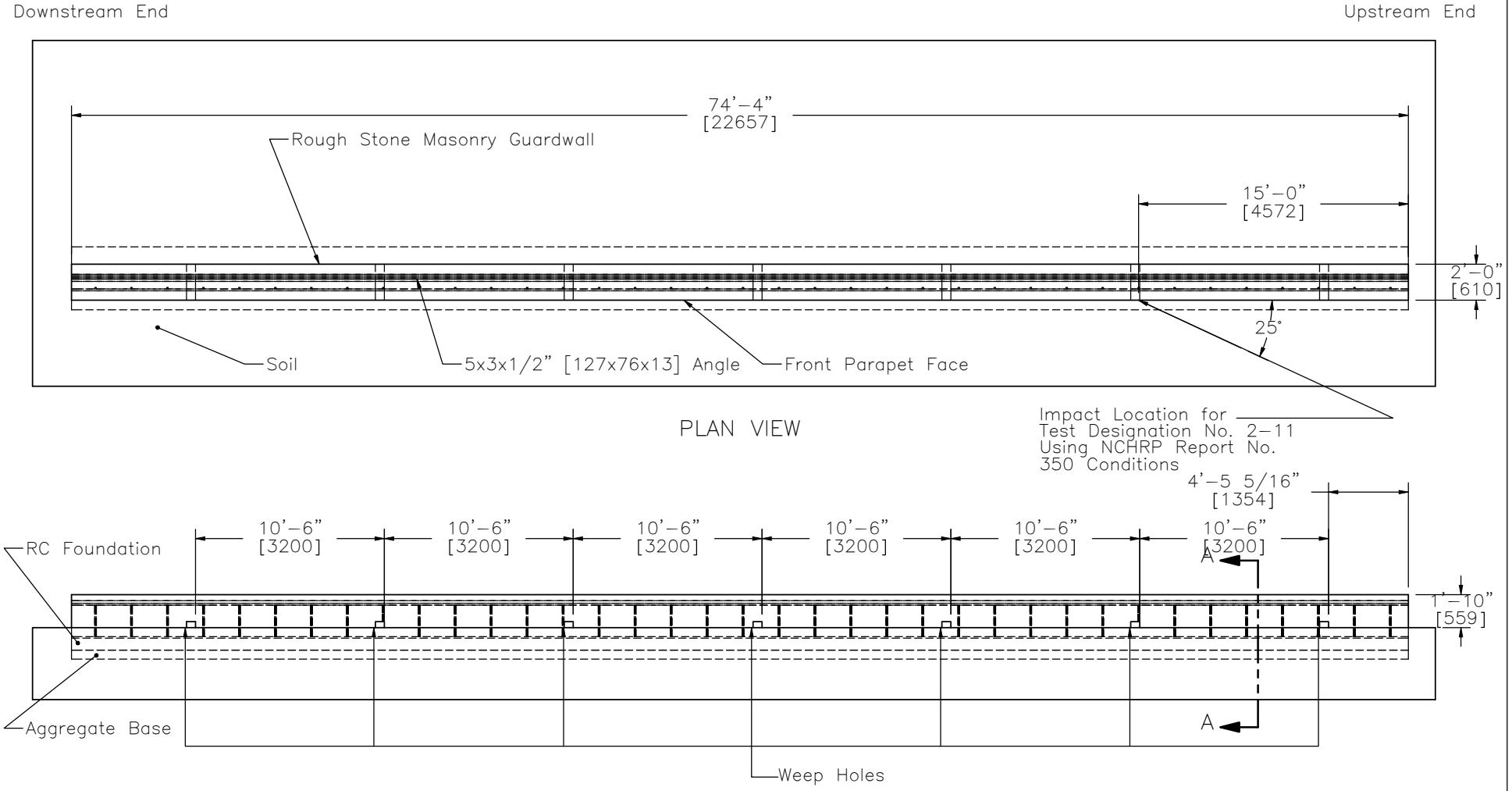


Notes: (1) Use a minimum of 1 ft [305] between the front edge of the foundation and the concrete cutout at the MwRSF test site.

(2) Internal steel reinforcement not shown for clarity.

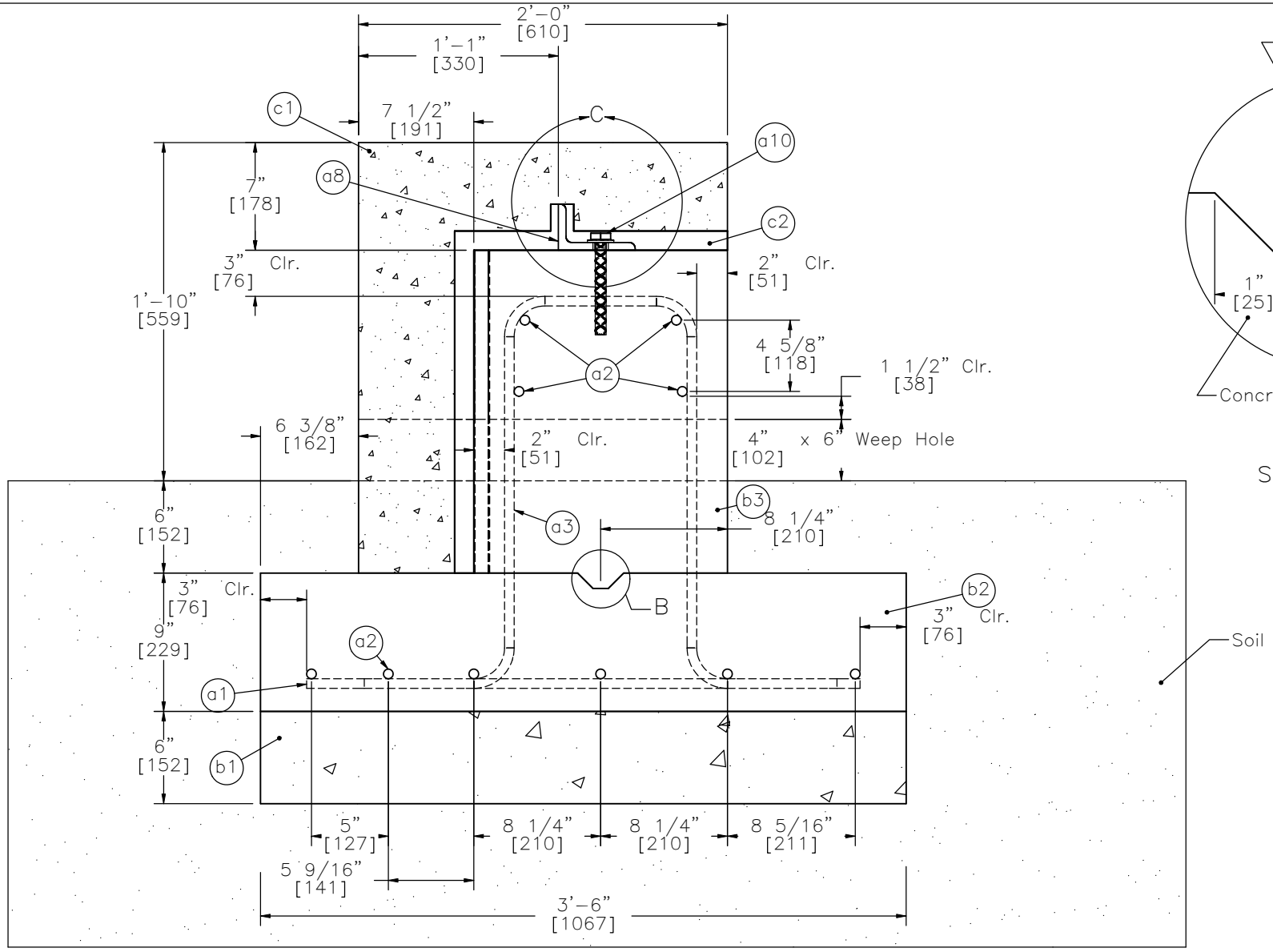
Midwest Roadside Safety Facility

Test Level 2 Rough Stone Masonry Guardwall

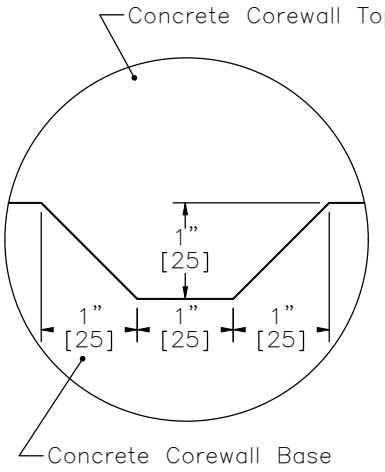
(Test No. RSMG–1)

System Layout

SHEET:	1 of 15
DATE:	1/29/2009
DRAWN BY:	CDB/RJT/EAJ
REV. BY:	RKF/KAL
DWG. NAME.	RSMG–1v15
SCALE:	1:100
UNITS:	In.[mm]

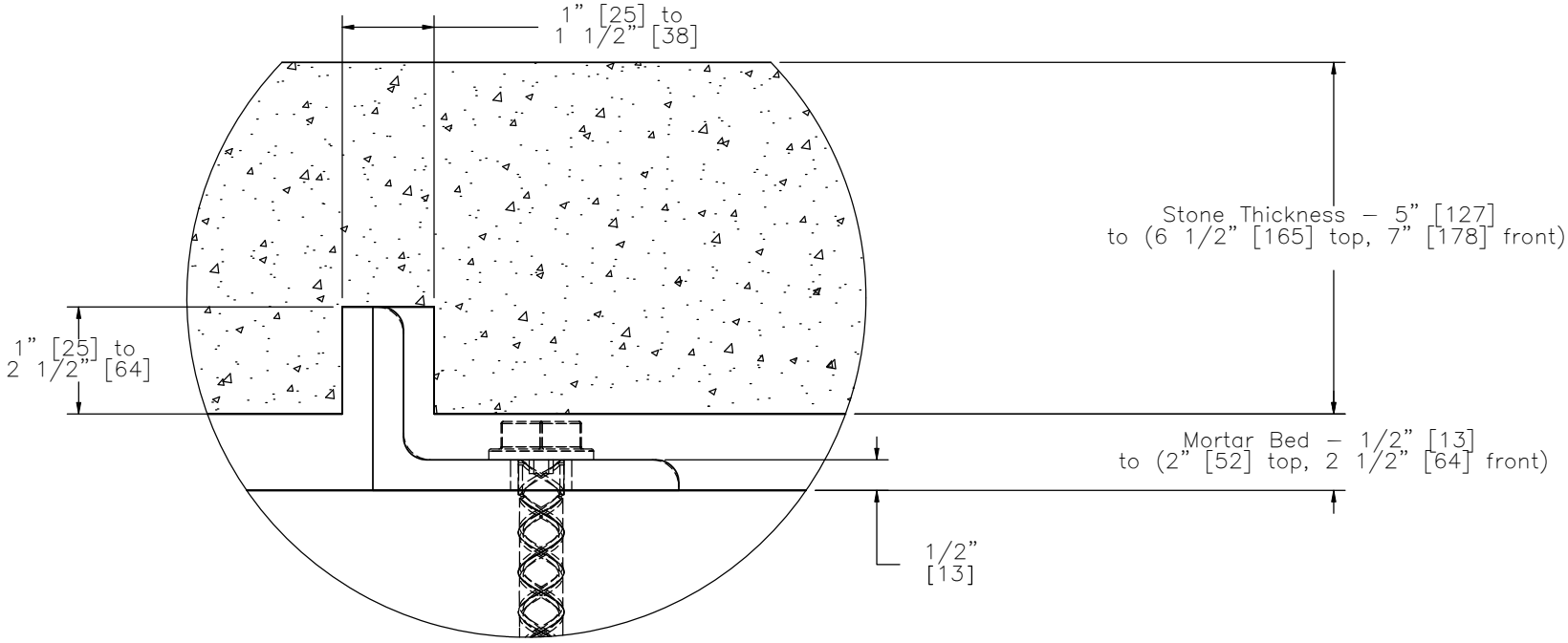


SECTION A–A



DETAIL B
SCALE 1 : 2

Midwest Roadside Safety Facility	Test Level 2 Rough Stone Masonry Guardwall (Test No. RSMG–1) End Section Detail View	SHEET: 2 of 15 DATE: 1/29/2009 DRAWN BY: CDB/RJT/EAJ
	DWG. NAME. RSMG–1v15 SCALE: 1:15 UNITS: In.[mm]	REV. BY: RKF/KAL



DETAIL C

Notes:

(1) The capstones placed on the top of the barrier shall be kerfed to allow for their placement over the steel angle. The kerf width shall be approximately 1 to 1 1/2 in. [25 to 38] wide. The maximum kerf depth shall be 2 1/2 in. [64] although thinner kerf depths are allowed as long as all other geometries are met.

(2) The top mortar bed thickness shall range between 1/2 and 2 in. [13 and 52] for rubble stone masonry. The top capstone thickness shall range between 5 to 6 1/2 in. [127 to 165].

(3) Morter shall fill the void region surrounding the angle's vertical leg when the capstones are set in place.

(4) The first 36 to 38 ft [10.9 to 11.6 m] of barrier shall be constructed with capstones covering the entire barrier width of 24 in. [610], thus revealing a mortar joint on the front face.

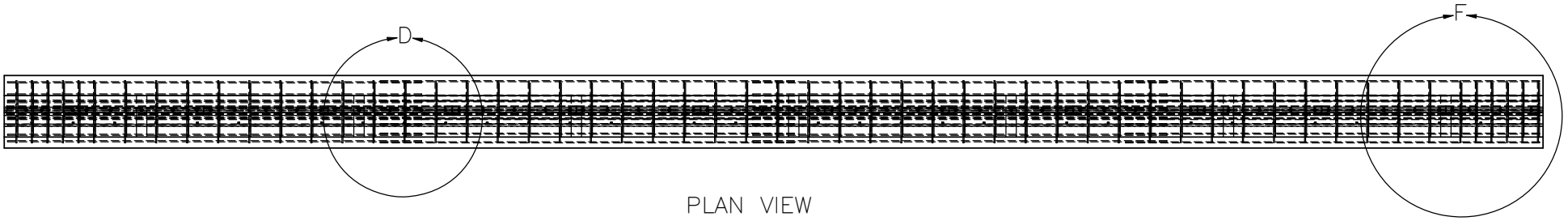
(5) The remaining barrier length shall be constructed using alternating face and top stones to meet up at the top–front corner of the barrier.

(6) For top capstone thicknesses greater than 5 7/8 in. [149], it will be necessary to chisle the bottom of the stone to form a dish to allow its placement over the heads of the Wedge–Bolt anchors.

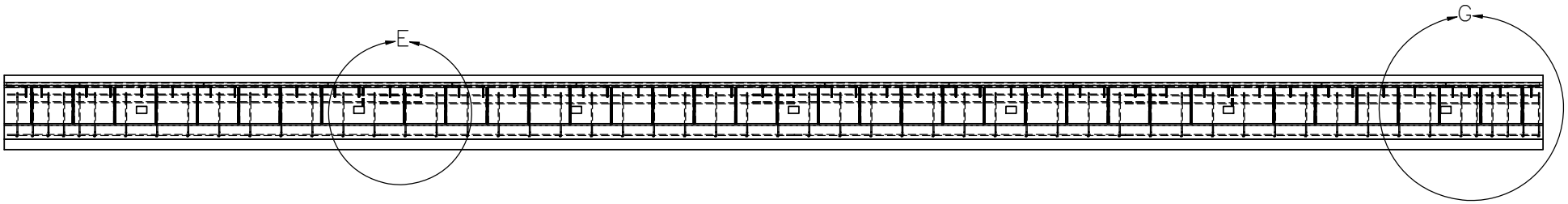
(7) Two types of steel anchors were used to provide vertical attachment of the stone masonry to the top of the inner core wall. Type 106 corrugated Dovetail Anchor Ties (16 gauge [1.5] by 5 1/2" [140] long) were wedged under the top–mounting angles and bent upward to engage the mortar. The Type 106 Ties were spaced approximately on 2 ft [610] centers, alternating sides of the steel angles. Stainless steel (SS 304) Z–clips were also used to anchor the stone using 1/4" [6.4] diameter by 2 3/4" [70] long, heavy–weight, stainless steel Tapcon masonry anchors. The Z–clips were spaced approximately on 2 ft [610] centers, alternating sides of the steel angles, and used to engage a recess cut in the stone.

(8) Dovetail Anchor Ties shall be mill galvanized steel ASTM A653 or hot dip glavanized ASTM A153.

MwRSF	Test Level 2 Rough Stone Masonry Guardwall	SHEET: 3 of 15
	(Test No. RSMG–1)	DATE: 1/29/2009
Midwest Roadside Safety Facility	Mortar Bed Details	DRAWN BY: CDB/RJT/EAJ
	DWG. NAME. RSMG–1v15 / SCALE: 1:3 / UNITS: In.[mm]	REV. BY: RKF/KAL



PLAN VIEW



ELEVATION VIEW

Midwest Roadside Safety Facility

Test Level 2 Rough Stone Masonry Guardwall

(Test No. RSMG-1)

Rebar Placement

DWG. NAME. RSMG-1v15

SCALE: 1:90

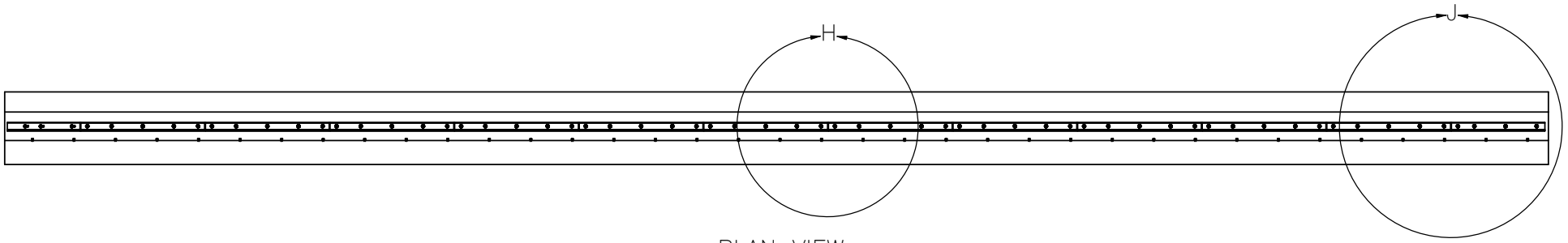
UNITS: In.[mm]

SHEET: 4 of 15

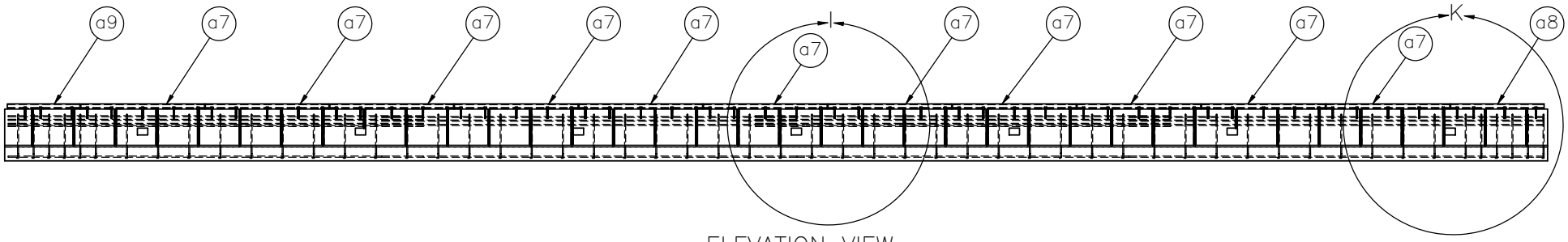
DATE: 1/29/2009

DRAWN BY: CDB/RJT/EAJ

REV. BY: RKF/KAL



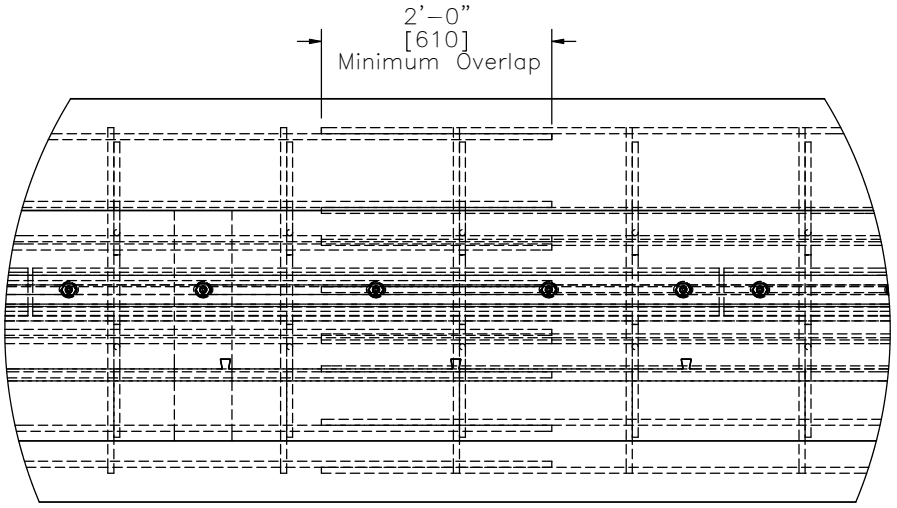
PLAN VIEW



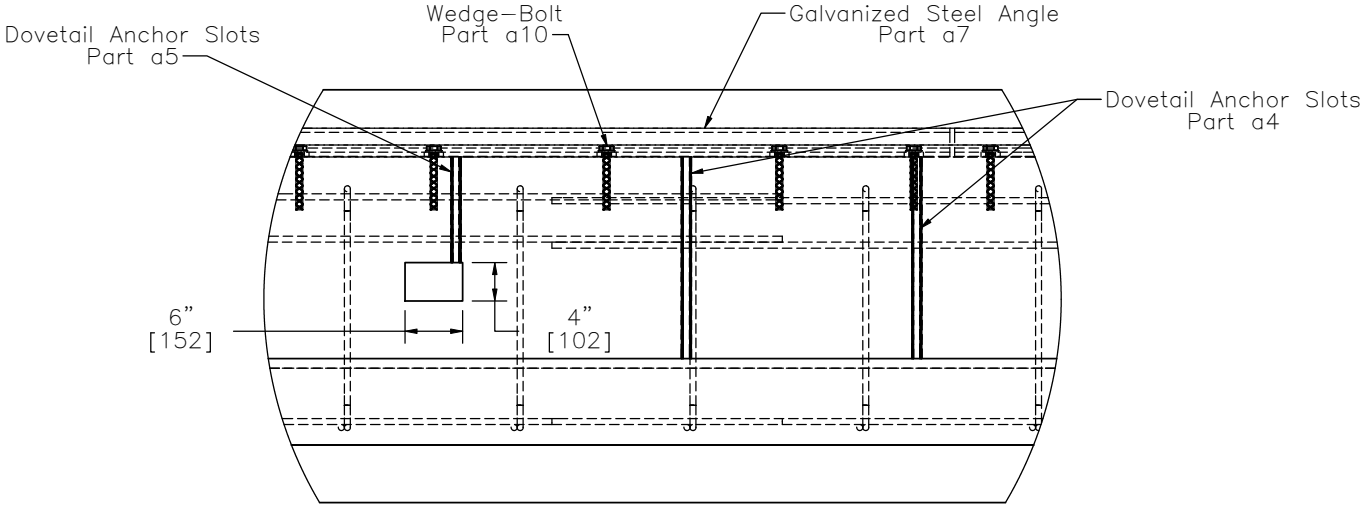
ELEVATION VIEW

Note: (1) Vertical stirrup locations shown on elevation view only.

MwRSF Midwest Roadside Safety Facility	Test Level 2 Rough Stone Masonry Guardwall (Test No. RSMG–1) Angle Placement	SHEET: 5 of 15 DATE: 1/29/2009 DRAWN BY: CDB/RJT/EAJ
	DWG. NAME. RSMG–1v15 SCALE: 1:90 UNITS: In.[mm]	REV. BY: RKF/KAL



DETAIL D



DETAIL E

Notes:
(1) The open channels in the Dovetail Anchor Slots are 1"x1"x5/8" [25x25x16] and are foam filled to protect slot during concrete forming and placement.
(2) Two Type 106 Dovetail Anchor Ties shall be placed in each Dovetail Anchor Slot to attach the rubble stone masonry to the front face of the inner core wall.
(3) Bend at least 25 percent of Dovetail Anchor Ties at a short right angle to engage a recess cut in the stone. Extend the anchors to within 3 in. [76] of the exposed face of the stone work.

Midwest Roadside Safety Facility

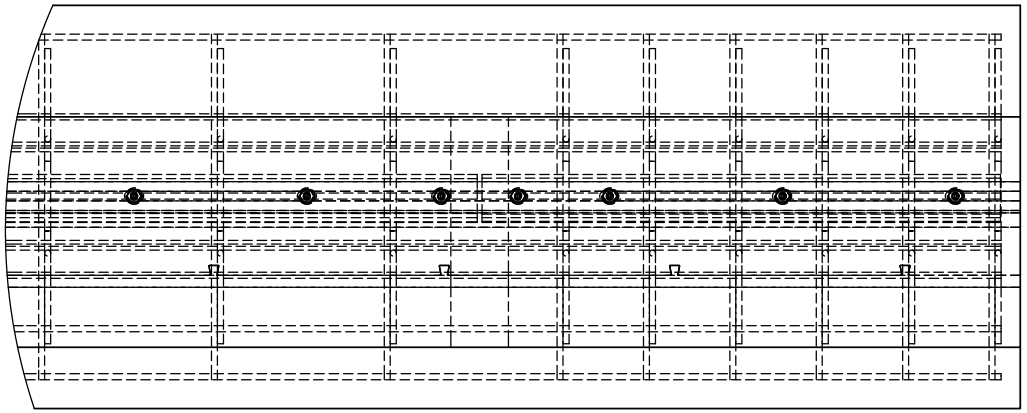
Test Level 2 Rough Stone Masonry Guardwall

(Test No. RSMG–1)

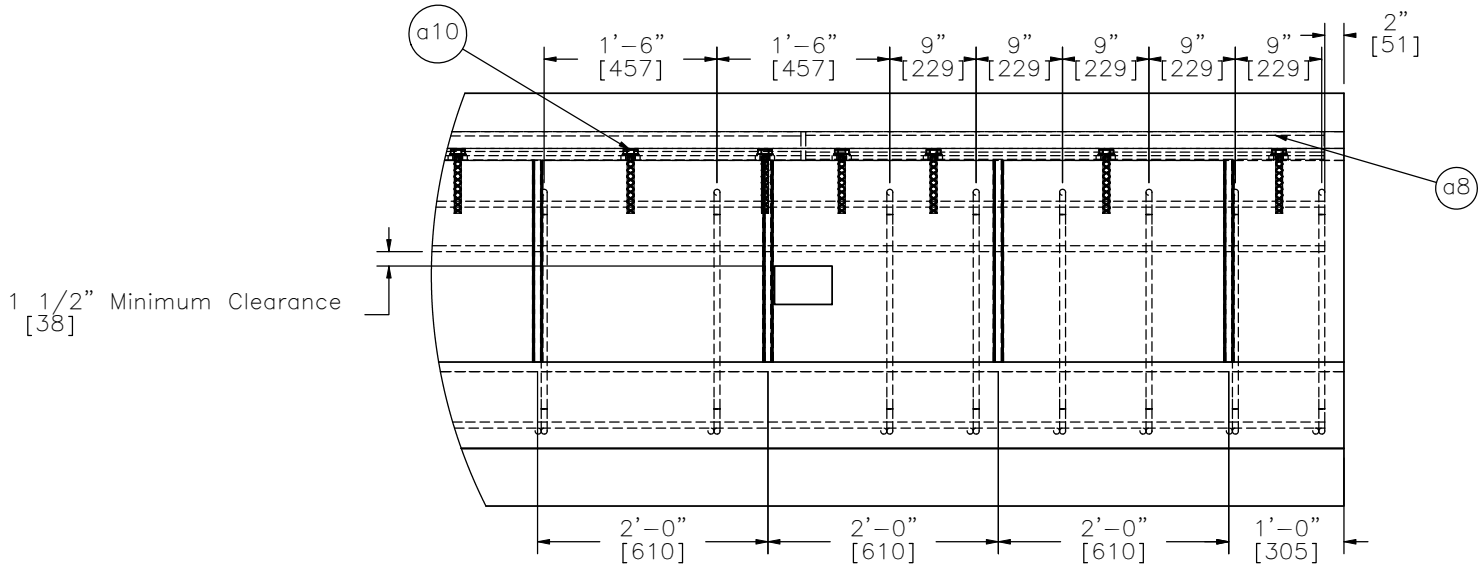
Reinforcement Details

SHEET: 6 of 15
DATE: 1/29/2009
DRAWN BY: CDB/RJT/EAJ
REV. BY: RKF/KAL

DWG. NAME. RSMG–1v15
SCALE: 1:20
UNITS: In.[mm]

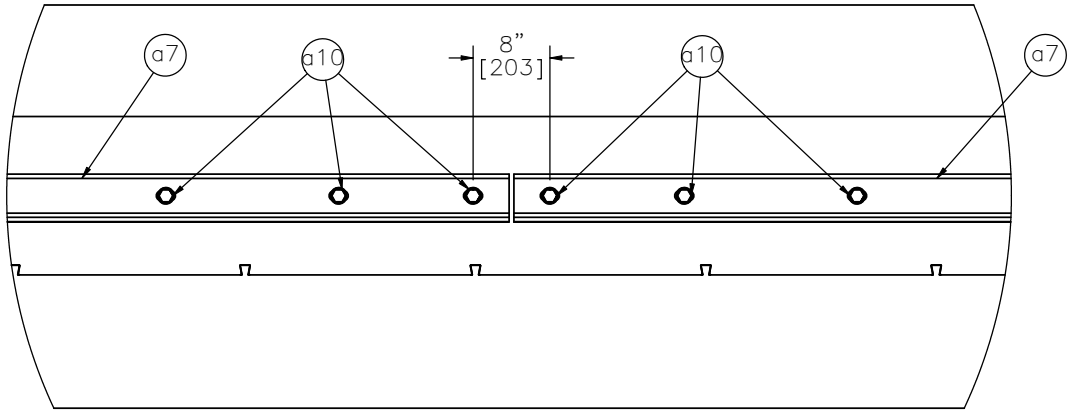


DETAIL F

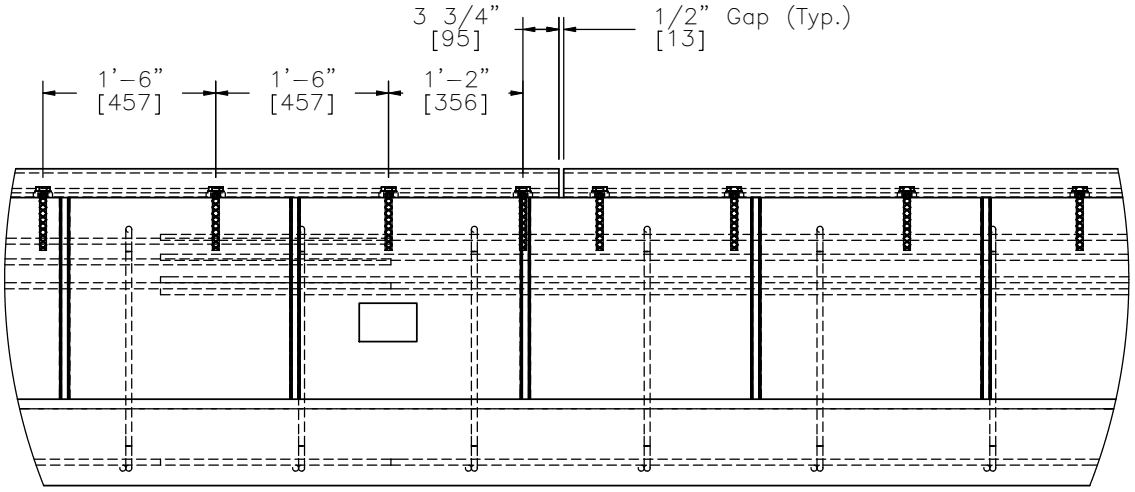


DETAIL G

Midwest Roadside Safety Facility	Test Level 2 Rough Stone Masonry Guardwall (Test No. RSMG–1) Reinforcement Details	SHEET: 7 of 15 DATE: 1/29/2009 DRAWN BY: CDB/RJT/EAJ
	DWG. NAME. RSMG–1v15 SCALE: 1:20 UNITS: In.[mm]	REV. BY: RKF/KAL



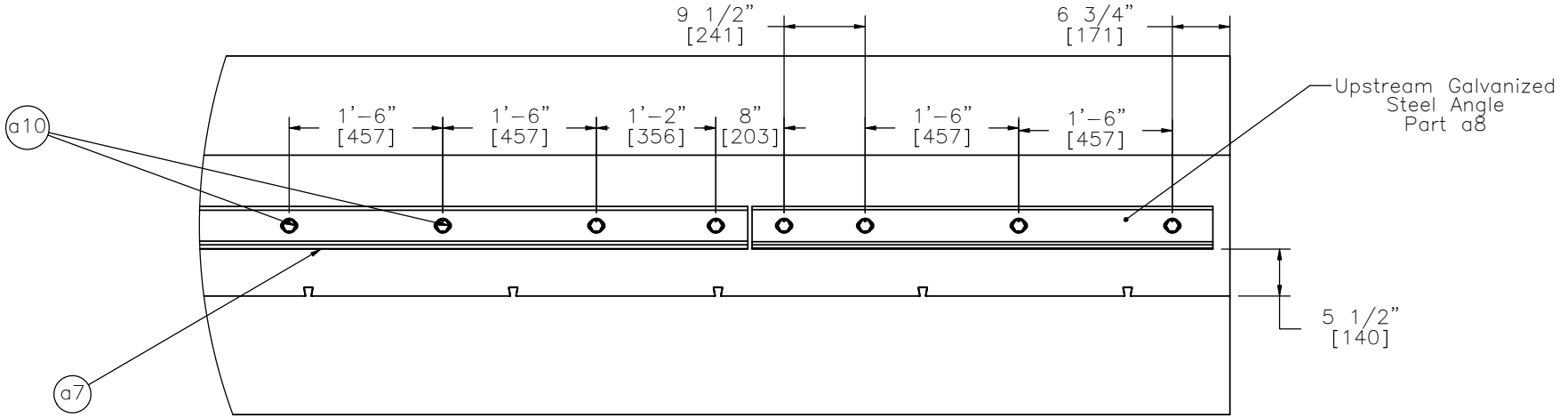
DETAIL H



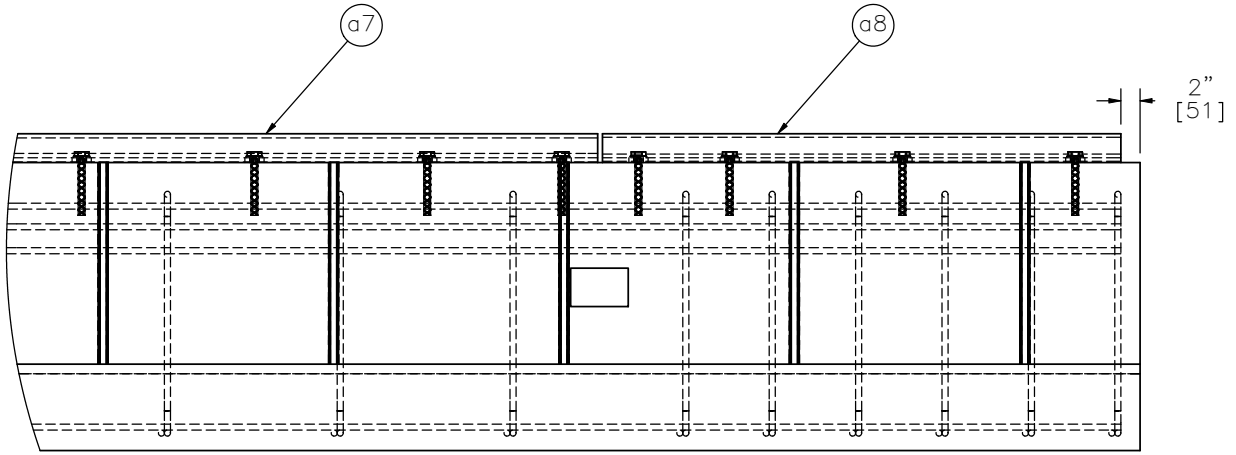
DETAIL I

Note: (1) Vertical stirrup locations shown on elevation view only.

MwRSF	Test Level 2 Rough Stone Masonry Guardwall (Test No. RSMG-1)	SHEET: 8 of 15
		DATE: 1/29/2009
Midwest Roadside Safety Facility	Angle Placement Details	DRAWN BY: CDB/RJT/EAJ
	DWG. NAME. RSMG-1v15 / SCALE: 1:20 / UNITS: In.[mm]	REV. BY: RKF/KAL



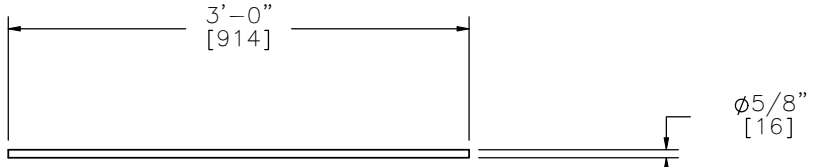
DETAIL J



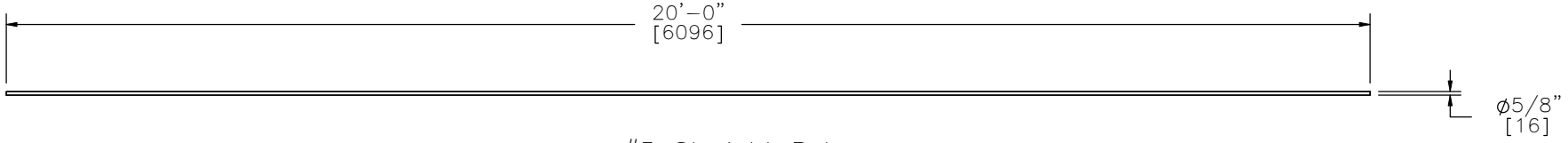
DETAIL K

Note: (1) Vertical stirrup locations shown on elevation view only.

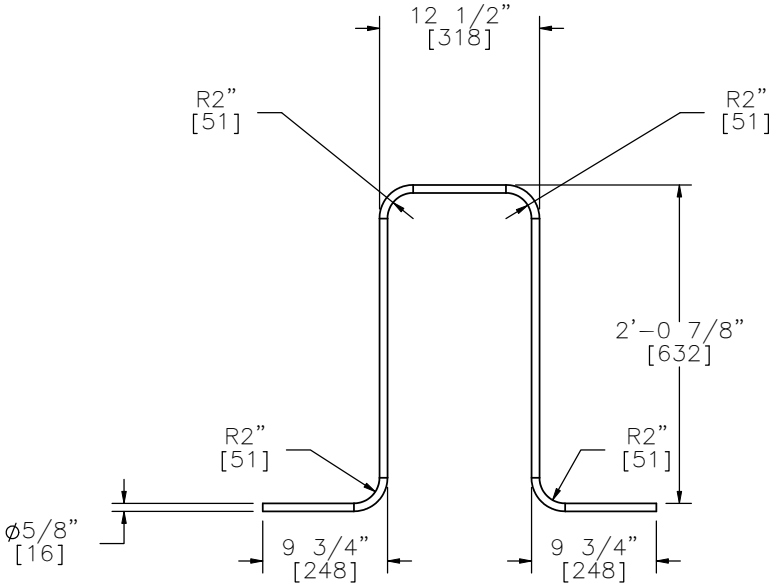
Midwest Roadside Safety Facility	Test Level 2 Rough Stone Masonry Guardwall (Test No. RSMG-1) Angle Placement Details	SHEET: 9 of 15 DATE: 1/29/2009 DRAWN BY: CDB/RJT/EAJ
	DWG. NAME. RSMG-1v15 SCALE: 1:20 UNITS: In.[mm]	REV. BY: RKF/KAL



#5 Straight Rebar
Part a1

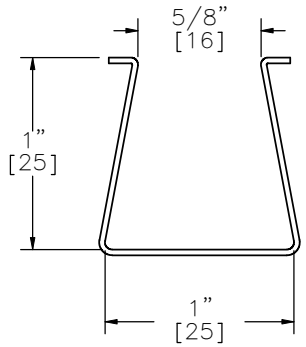


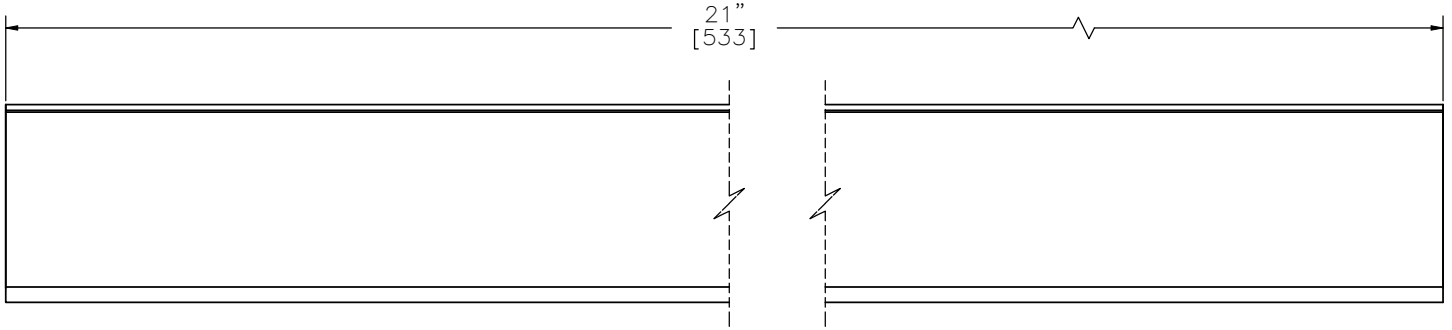
#5 Straight Rebar
Part a2
SCALE 1 : 30



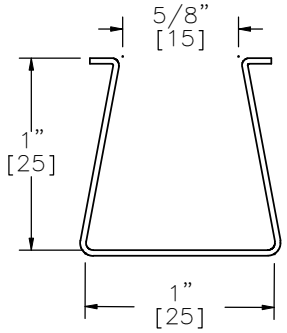
#5 Bent Rebar
Part a3

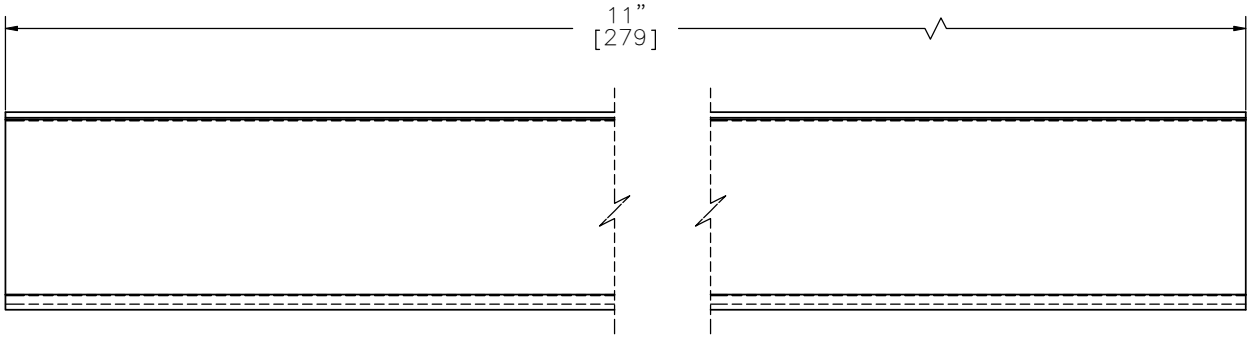
MwRSF	Test Level 2 Rough Stone Masonry Guardwall (Test No. RSMG-1)	SHEET: 10 of 15
	Rebar Details	DATE: 1/29/2009
		DRAWN BY: CDB/RJT/EAJ
Midwest Roadside Safety Facility	DWG. NAME. RSMG-1v15	SCALE: 1:15 UNITS: In.[mm]
		REV. BY: RKF/KAL





Dovetail Anchor Slot
22 Gauge [0.8]
Part a4





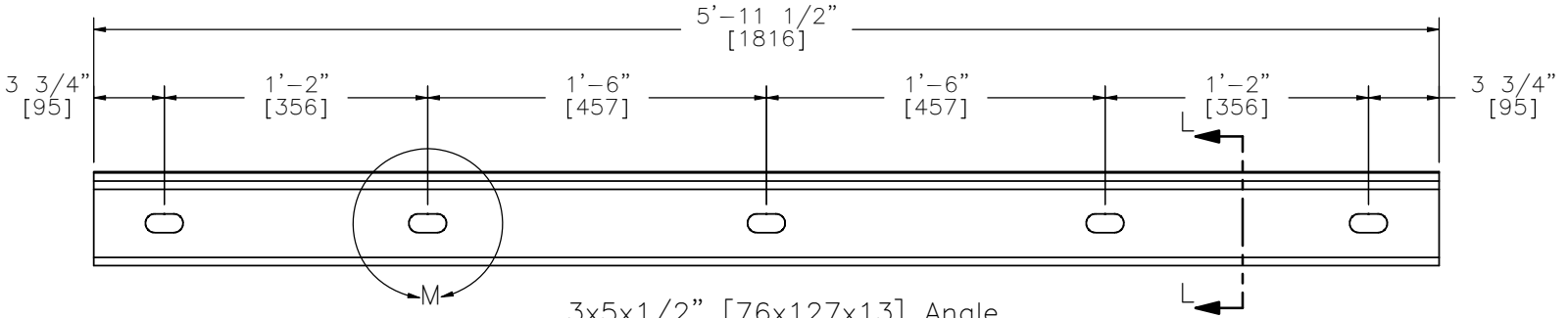
Dovetail Anchor Slot
22 Gauge [0.76]
Part a5

Notes: (1) The finish for the Dovetail Anchor Slots shall be mill galvanized steel ASTM A653, hot dip galvanized steel ASTM A153, or Class B2 depending upon the material selected.

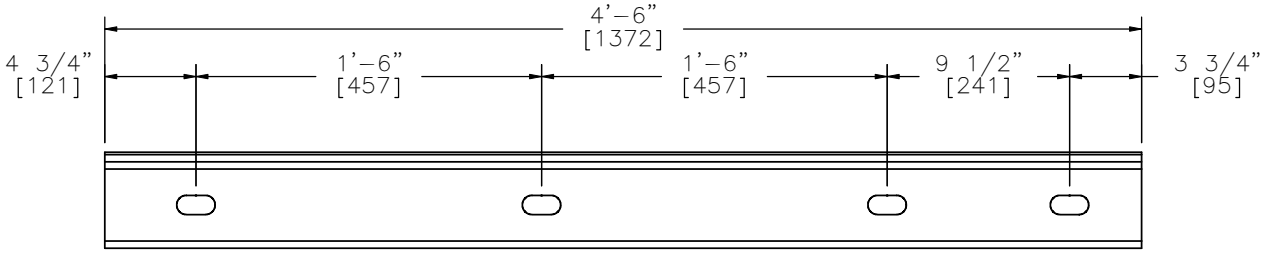
(2) Two Dovetail Anchor Ties shall be used with each Dovetail Anchor Slot in order to attach the rubble stone masonry to the face of the inner concrete core wall. Type 106 (16 gauge [1.5] by 5 1/2" [140] long) Dovetail Corrugated Anchors shall be mill galvanized steel ASTM A653 or hot dip galvanized ASTM A153.

(3) Bend at least 25 percent of anchor ties at a short right angle to engage a recess cut in the stone. Extend the anchors to within 3 in. [76] of the exposed face of the stone work.

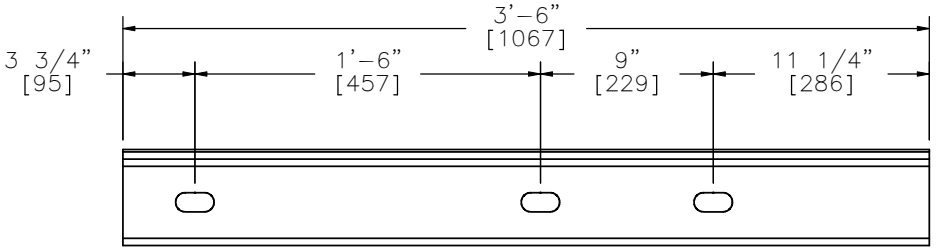
Midwest Roadside Safety Facility	Test Level 2 Rough Stone Masonry Guardwall (Test No. RSMG-1) Channel Anchor Details	SHEET: 11 of 15 DATE: 1/29/2009 DRAWN BY: CDB/RJT/EAJ
	DWG. NAME. RSMG-1v15 SCALE: None UNITS: In.[mm]	REV. BY: RKF/KAL



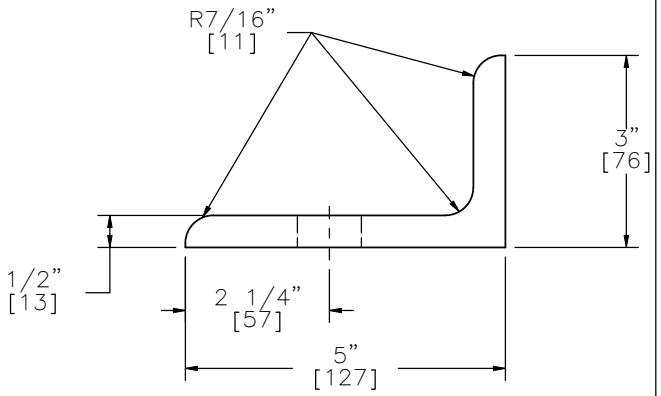
3x5x1/2" [76x127x13] Angle
Part a7



Upstream End Angle
Part a8



Downstream End Angle
Part a9



SECTION L–L
SCALE 1 : 3

Notes:
(1) Angles are used to provide lateral shear resistance for the rubble stone masonry placed on top of the inner core wall.

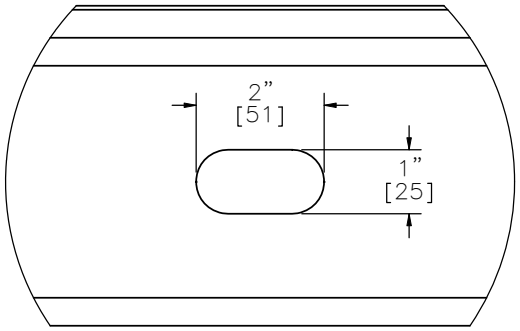
(2) Spacing between all angles is approximately 1/2" [13].

(3) Interior steel angles are attached with Wedge–Bolt anchors. Interior anchors are centered between stirrups. End anchors on interior angles are placed between stirrups, but not centered since an anchor from the adjacent angle must also be placed within the same stirrup span.

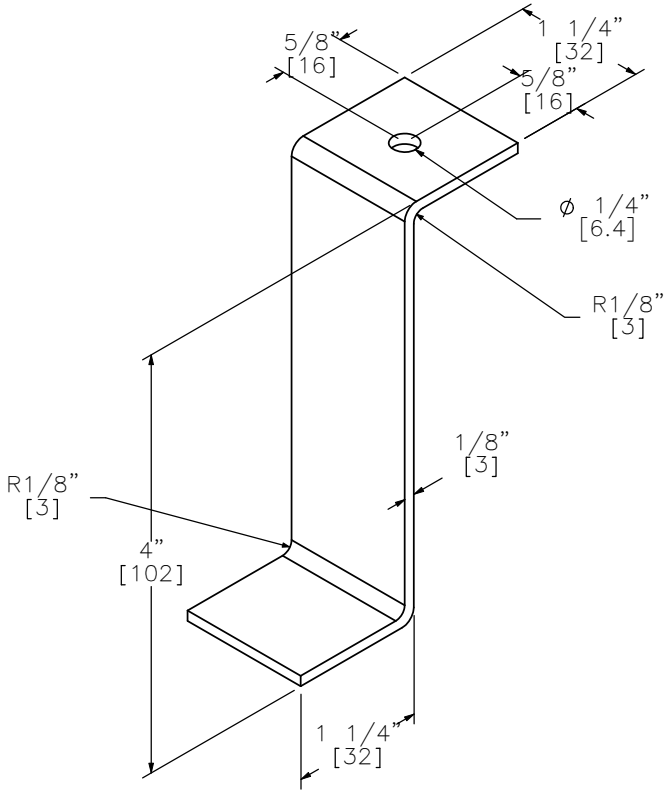
Midwest Roadside Safety Facility

Test Level 2 Rough Stone Masonry Guardwall
(Test No. RSMG–1)
Angle Details

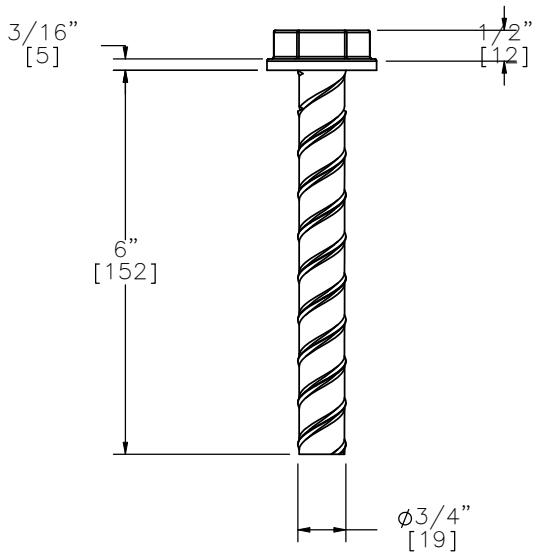
SHEET: 12 of 15
DATE: 1/29/2009
DRAWN BY: CDB/RJT/EAJ
REV. BY: RKF/KAL
DWG. NAME. RSMG–1v15
SCALE: 1:10
UNITS: In.[mm]



DETAIL M

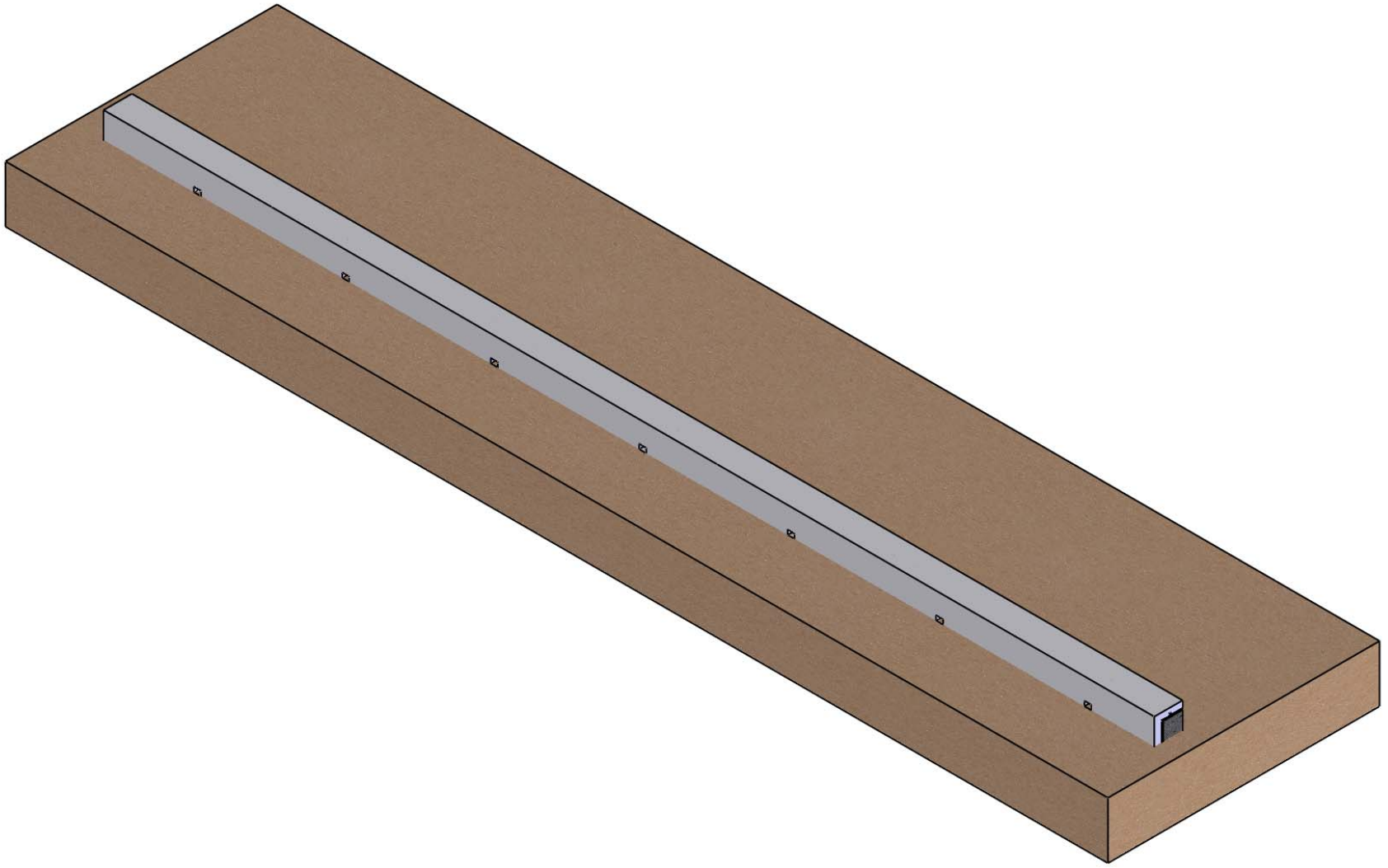


304 Stainless Steel Z-Clip
Part a11
SCALE 2 : 3



Ø3/4" [19] x 6" [152] Wedge-Bolt Anchor
Part a10

Midwest Roadside Safety Facility	Test Level 2 Rough Stone Masonry Guardwall (Test No. RSMG-1) Hole and Wedge-Bolt Dimensions	SHEET: 13 of 15 DATE: 1/29/2009 DRAWN BY: CDB/RJT/EAJ
	DWG. NAME. RSMG-1v15 SCALE: 1:3 UNITS: In.[mm]	REV. BY: RKF/KAL



Midwest Roadside Safety Facility

Test Level 2 Rough Stone Masonry Guardwall

(Test No. RSMG-1)

System Isometric View

DWG. NAME. RSMG-1v15

SCALE: 1:95

UNITS: In.[mm]

SHEET: 14 of 15

DATE: 1/29/2009

DRAWN BY: CDB/RJT/EAJ

REV. BY: RKF/KAL

Test Level 2 Rough Stone Masonry Guardwall			
Item No.	QTY.	Description	Material Specifications
a1	55	#5 Straight Rebar, 3' [914] long	Grade 60
a2	40	#5 Straight Rebar, 20' [6096] long	Grade 60
a3	55	#5 Bent Rebar	Grade 60
a4	35	Dovetail Anchor Slot 21" [533] long (22 gauge [0.8])–Galvanized	ASTM A1008, A109, or A1011
a5	2	Dovetail Anchor Slot 11" [279] long (22 gauge [0.8])–Galvanized	ASTM A1008, A109, or A1011
a7	11	5x3x1/2" [127x76x13] Interior Angle	Galvanized, ASTM A36 Steel
a6	111	Dovetail Anchor Tie (16 gauge [1.5] by 5 1/2" [140] long by 1" [25] wide)	Galvanized Steel
a8	1	5x3x1/2" [127x76x13] Upstream End Angle	Galvanized, ASTM A36 Steel
a9	1	5x3x1/2" [127x76x13] Downstream End Angle	Galvanized, ASTM A36 Steel
a10	62	3/4" [19] Dia. by 6" [152] long Wedge–Bolt Anchor	Galvanized, Carbon Steel
a11	37	Z–Clips	304 Stainless Steel
a12	37	Heavy–Weight, Tapcon Masonry Anchors – 1/4" [6.4] Diam. x 2 3/4" [70] long	Stainless Steel
b1	1	3'–6" x 74'–4" x 6" [1.1mx22.7mx152mm] Aggregate Base	Aggregate
b2	1	Concrete Corewall Base	f'c = 3,500 psi [24.1 MPa]
b3	1	Concrete Corewall Top	f'c = 3,500 psi [24.1 MPa]
c1	1	Rough Stone Masonry Facade (Rubble Masonry)	Sound, Durable Rock with Mortar
c2	1	Mortar Bed – PROMIX Stone Veneer Mortar conforming to ASTM C–270 Type S Specifications	FHWA Section 712.05(a)

Midwest Roadside Safety Facility

Test Level 2 Rough Stone Masonry Guardwall

(Test No. RSMG–1)

Bill Of Materials

SHEET: 15 of 15

DATE: 1/29/2009

DRAWN BY: CDB/RJT/EAJ

DWG. NAME. RSMG–1v15

SCALE: None

UNITS: In.[mm]

REV. BY: RKF/KAL