U.S. Department
Of Transportation
Federal Highway
Administration

400 Seventh St., S.W.
Washington, D.C. 20590

January 13, 1997

Refer to: HNG-14/SS-72

Mr. Dave Chandler
President
Foresight Products, LLC
6430 East 49th Drive
Commerce City, Colorado 80022

Dear Mr. Chandler:

This is in response to your October 25 letter to Mr. Gerald L. Eller requesting that the Federal Highway Administration (FHWA) accept your company's V-Loc breakaway sign support system for use on the National Highway System (NHS). Mr. Thomas Jewett co-signed the letter which transmitted an August 1996 report of full-scale automobile testing conducted by the Texas Transportation Institute on single-post supports using the V-Loc with a U-channel post and with a thin-walled round tube, a video of the tests, drawing of the hardware, and other documentation. On December 11 you provided additional information in response to a request we made.

Requirements for breakaway supports are those in the American Association of State Highway and Transportation Officials' (AASHTO) Standard Specifications for Structural Supports for Highway Signs, Luminaries and Traffic Signals. We also recognize the testing and evaluation guidelines in the National Cooperative Highway Research Report Number 350, Recommended Procedures for the Safety Performance Evaluation of Highway Features.

The full-scale automobile tests are summarized in the following table:

Test Number	405631-1	405631-3	405631-2
Post Type	U-Channel	U-Channel	Round Tube
Impact Speed	34.6 km/h	99.5 km/h	35.2 km/h
Soil Type	Standard	Standard	Standard
Vehicle Mass	826 kg	826 kg	826 kg
Velocity Changes	1.1 m/s	1.7 m/s	1.0 m/s
Occupant Impact Speed	1.0 m/s	0.7 m/s	0.9 m/s
Stub Height	< 90 mm	None	None

Details of the tested U-channel and round tube posts, along with the perforated square steel tube posts for which you also request acceptance, are listed in Enclosure 1.

The foundation for the support is the V-Loc socket, which is constructed from 64-mm x 64-mm steel angle and 2.7-mm steel plate. The angle, which is 762 mm long, serves as the leg of the ground anchor. The 2.7 mm steel plate is bent into a warped "V" shape and welded flush with the top of the angle to form a socket and a soil bearing plate. A 19-mm diameter x 178-mm long hot rolled round bar extends diagonally from the bottom corner of the "V" shaped plate to the angle. In addition to serving as a brace for the socket system, the rod also helps prevent soil form accumulating in the socket during driving. The steel plate is ASTM A-569 steel, and the angle and rod are A-36 steel. Additional details and dimensions for the V-Loc socket are shown in the drawings in Enclosure 2.

A special adaptor is used with the V-Loc for use with a U-channel post. This galvanized steel tube, which is also described in Enclosure 1, has holes punched to facilitate breakage upon impact as shown in Enclosure 2. The adaptor is attached to the U-channel using two 11.1 mm bolts spaced at 76 mm. The adaptor is the top of the socket. A triangular wedge, common to all V-Loc sockets shown in Enclosure 2, is used to secure the adaptor inside the socket.

The V-Loc socket for thin-wall round tube supports is the same as described above. The round tube can be placed directly into the V-Loc and secured with at triangular wedge.

Because the results of the full-scale testing met the stub height and change-in-velocity criteria recognized by the FHWA, the V-Loc socket system mounted in standard soil with a single steel U-channel, with the U-channel Post Adaptor, or round tube similar to those tested will be acceptable for use on the National Highway System (NHS), in the range of conditions tested, when proposed by a State.

You also requested that the V-Loc socket be found acceptable for use with perforated square steel tube sign supports up to a size of modulus, yield strength, and yield moment of this support are all less than the tested round tube, the perforated square steel tube will also be considered acceptable for use with the V-Loc socket. Even though the socket must be oriented 45 degrees towards the roadway to accommodate the square section, we believe that breakaway performance will not be significantly affected.

Additionally, you requested acceptance of a version of the V-Loc for use in concrete foundations. There was very little movement of the V-Loc socket observed in the crash test in standard soil. Therefore, we believe that the V-Loc system will work at least as well if the socket is held firmly in concrete. This variant, also shown in Enclosure 2, will be acceptable for use with the cited support posts when place in a concrete foundation in strong soil. The foundation must be massive enough to provide the same resistance to overturning as was provided by the angle section embedded to a depth of 752 mm.

Our acceptance is limited to the breakaway characteristics of the cited supports when used with the V-Loc socket system and does not cover their structural features.

Presumably you will supply potential users with sufficient information on structural design and installation requirements to ensure proper performance. We anticipate that the States will require certification from Foresight Products that the hardware furnished has essentially the same chemistry, mechanical properties, and geometry as those you have described to us, and that they will meet the Federal Highway Administration change in velocity requirements.

The V-Loc socket system is a proprietary product. To be used in Federal-aid projects, except exempt, non-NHS projects: (a) must be supplied through completive bidding with equally suitable unpatented items; (b) the highway agency must certify that they are essential for synchronization with existing highway facilities for that no equally suitable alternative exists or; (c) they must be used for research or for a distinctive type of construction on relatively short sections of road for experimental purposes. Our regulations concerning proprietary products are contained in Title 23, Code of Federal Regulations, Section 635.411, a copy of which is enclosed.

Sincerely Yours,

Dwight A. Horne, Chief
Federal-Aid and Design Division

3 Enclosures

Geometric and Safety Design Acceptance Letter SS-72

Table 1. Properties of common small sign supports.

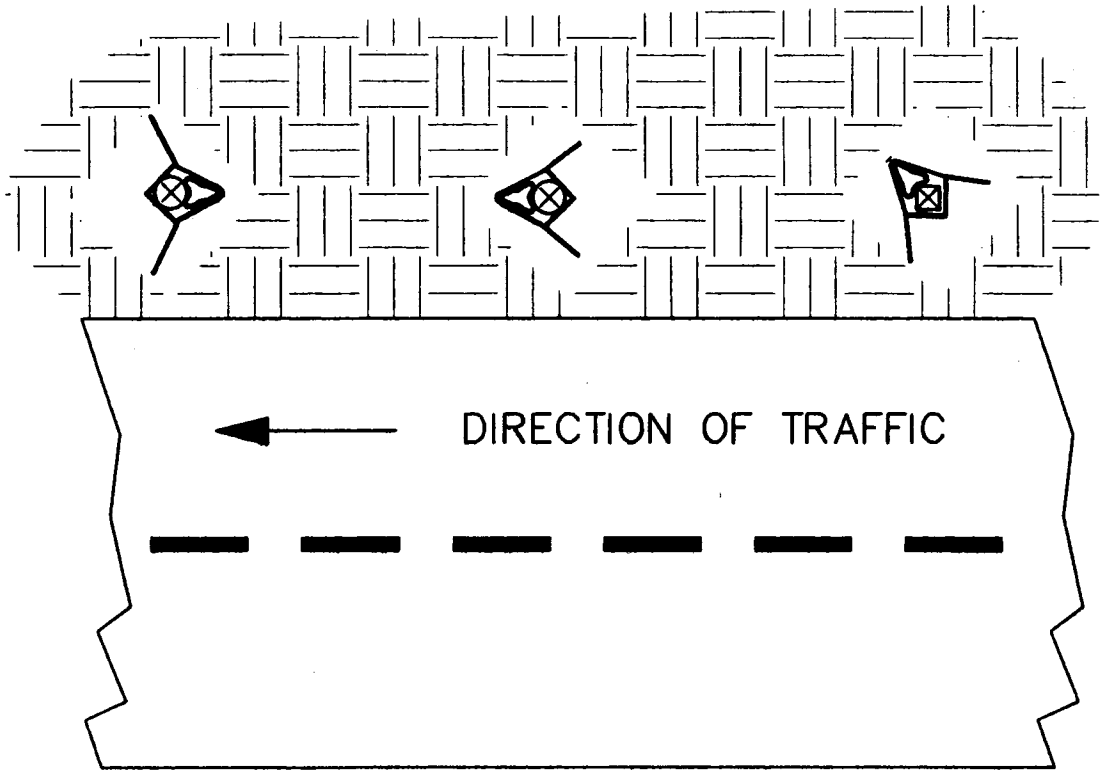
Support Type	Material	Size	Section Modulus mm^3 (in^3)	Yield Stress MPa (ksi)	Yield Moment N-m (lb-in)
Perforated Square Tubing	ASTM A-446	50.8 mm x 50.8 mm x 2.7 mm (2" x 2" x 0.105")	6,096 (0.372)[a]	227.5 (33)	1,386 (12,276)
Thin-Wall Round Tubing	ASTM A-500	60.3 mm O.D. x 2.4 mm wall (2.375" O.D. x 0.095" wall)	6,112 (0.373)[b]	379.2 (55)[b]	2,316 (20,515)
U-Channel	ASTM A-449	5.95 kg/m (4 lb/ft)	9,767 (0.596)[a]	413.7 (60)	4,037 (35,760)
U-Channel Adaptor	ASTM A-500 Grade B	48.3 mm O.D. x 3 mm wall (1.90" O.D. x 0.120" wall)	4,605 (0.281)	289.6 (42)	1,332 (11,802)[c]

[a] AASHTO "A Guide to Small Sign Support Hardware"
[b] Southwest Pipe, Inc.
[c] unweakened section

U-CHANNEL ADAPTER SIGN POST

ROUND TUBING SIGN POST

PERFORATED SQUARE SIGN POST



ROAD SIDE ORIENTATION

REV	ECN	DATE	BY	DESCRIPTION
A		12/10 1996	MG	REV. SQ TUBE ORIENTATION

DIMENSIONS IN INCHES

tolerances
UNLESS OTHERWISE SPECIFIED
X.X ±
X.XX ±
X.XXX ±
ANGLE ± 2°

material | SCALE
approved by
checked by
drawn by MG

FORESIGHT PRODUCTS inc
(303) 286-8955

V-LOC INSTALLATION

title | DWG SIZE: A

S20025 PG1OF3 | A

number | rev

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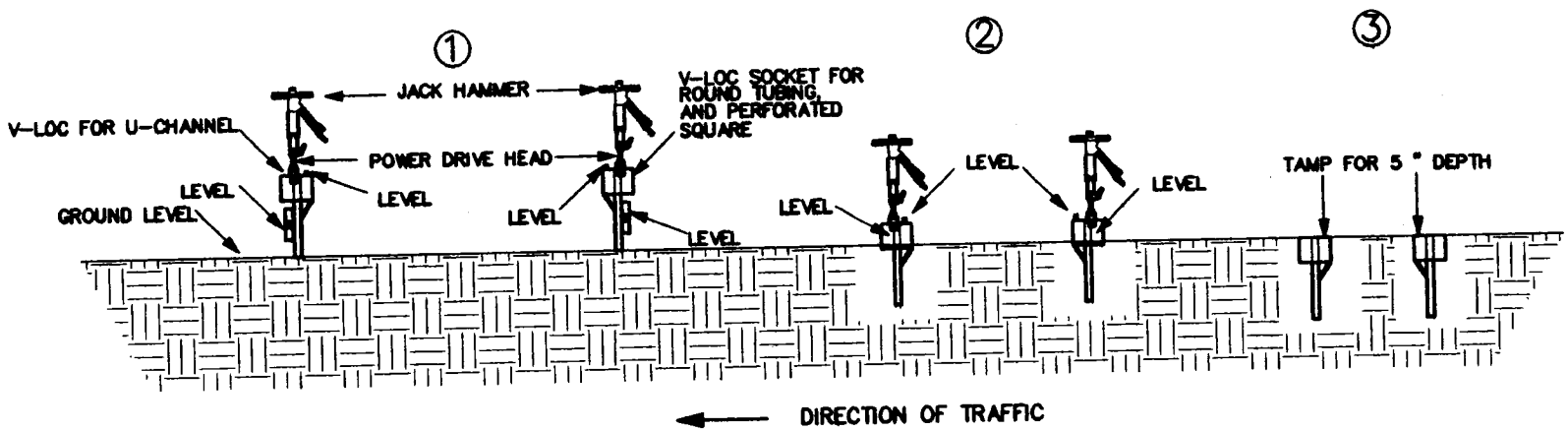

SOCKET INSTALLATION

REV	ECN	DATE	BY	DESCRIPTION
A		12/10 1996	MG	REV. SQ TUBE ORIENTATION

DIMENSIONS IN INCHES

tolerances UNLESS OTHERWISE SPECIFIED
X.X ±
X.XX ±
X.XXX ±
ANGLE ± 2°

material | SCALE
approved by
checked by
drawn by MG

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(303) 286-8955

V-LOC INSTALLATION

title | DWG SIZE: A
S20025 PG2OF3 | A
number | rev

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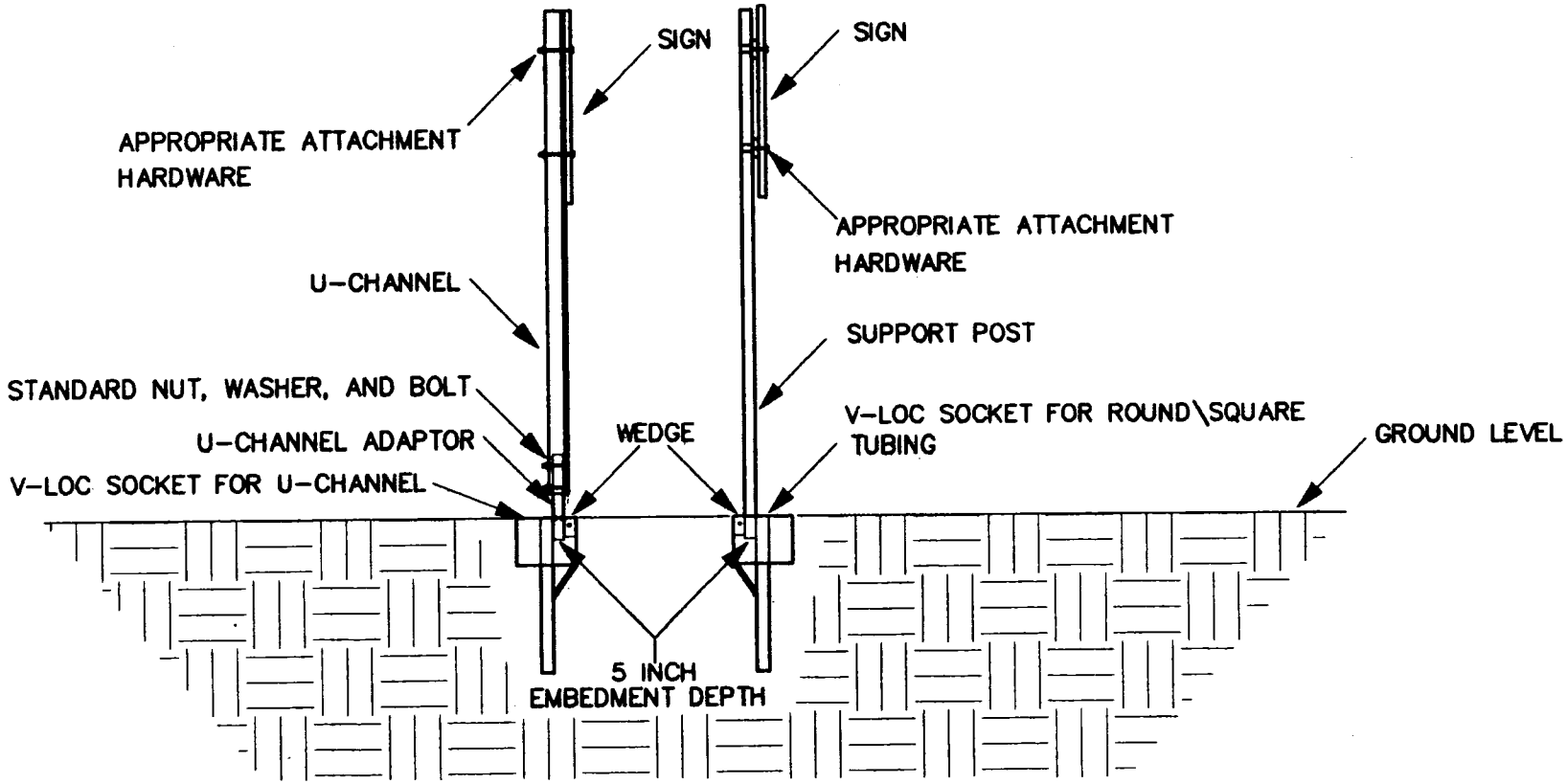


DIRECTION OF TRAFFIC

SIGN AND SUPPORT INSTALLATION

REV	ECN	DATE	BY	DESCRIPTION
A		12/10 1996	MG	REV. SQ TUBE ORIENTATION

DIMENSIONS IN INCHES

tolerances
UNLESS OTHERWISE SPECIFIED
X.X ±
X.XX ±
X.XXX ±
ANGLE ± 2°

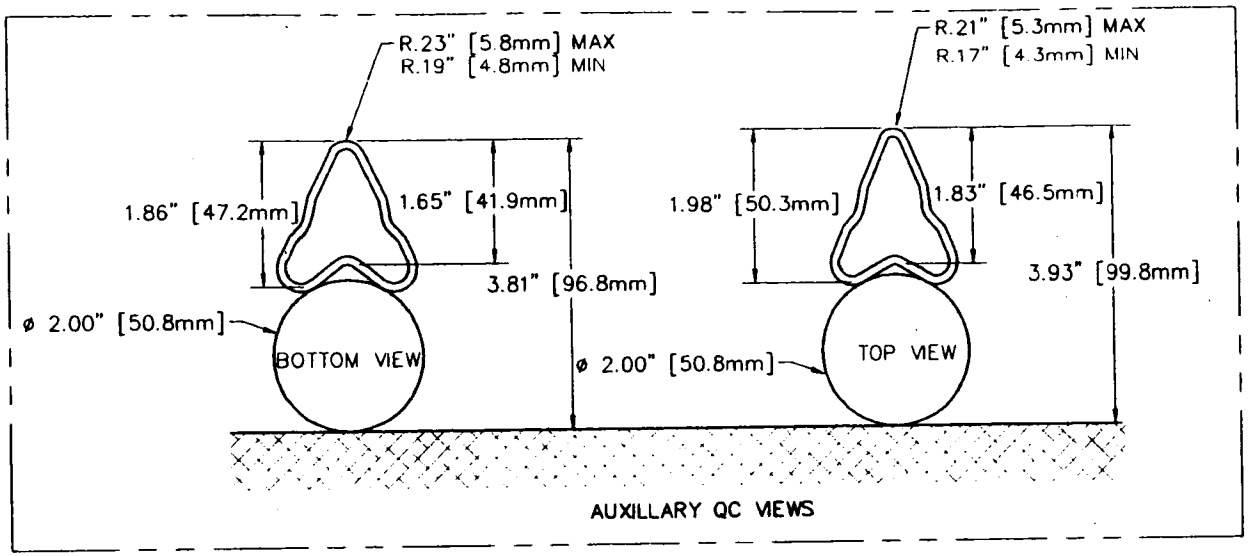
material | SCALE
approved by
checked by
drawn by MG

FORESIGHT PRODUCTS inc
(303) 286-8955

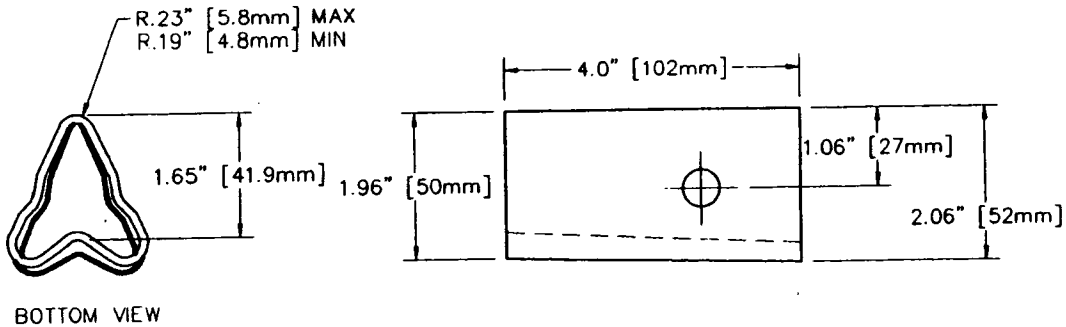
V-LOC INSTALLATION

title | DWG SIZE: A
S20025 3OF3 | A
number | rev

C:\ ACLTWIN\FORSIGHT\HIWAY\S20025\



AUXILLARY QC VIEWS



BOTTOM VIEW

TOP VIEW

REV	ECN	DATE	BY	DESCRIPTION
C	156	10/24 1996	MG	ADDED METRIC SCALE
B	142	4/1 1996	MG	REMOVED SCALE
A	132	10/19 1995	MG	ADDED TOLERANCES
		8-21 1995	TB	CHANGED DRAWING NO.
	104	12-5 1994	RJ	DRAWING ORIGINATION

DIMENSIONS AS NOTED

tolerances UNLESS OTHERWISE SPECIFIED
X.X ±.250
X.XX ±.125
X.XXX ±.060

12 GAUGE ROUND MECH TUBING, ZINC FLOW COAT AS TO ASTM A-500-B
SCALE 1:1.5

material | scale:

approved by TJ

checked by TB

drawn by MG

FORESIGHT PRODUCTS inc
(303) 286-8955

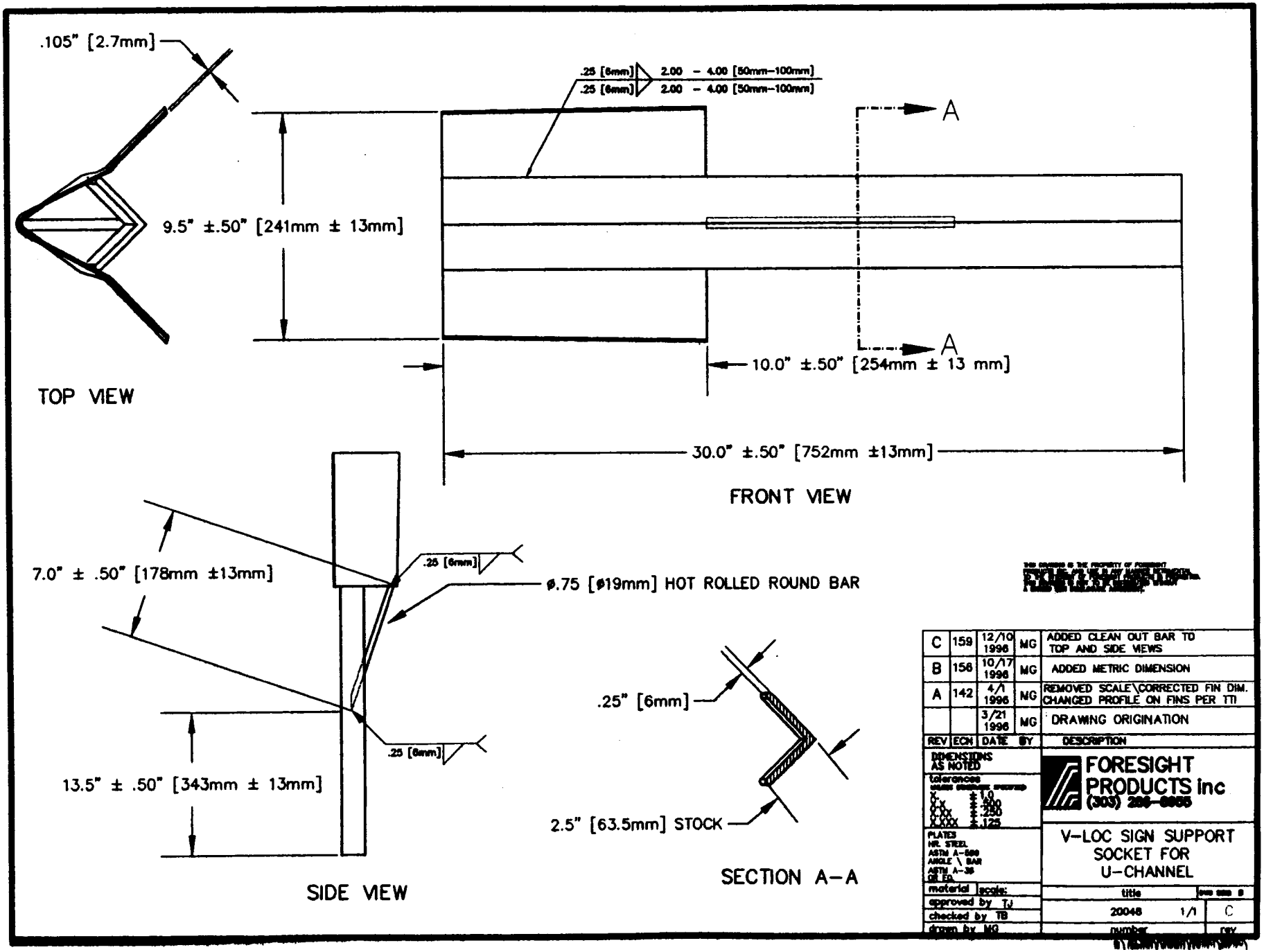
V-LOC FORMED AND PUNCHED WEDGE

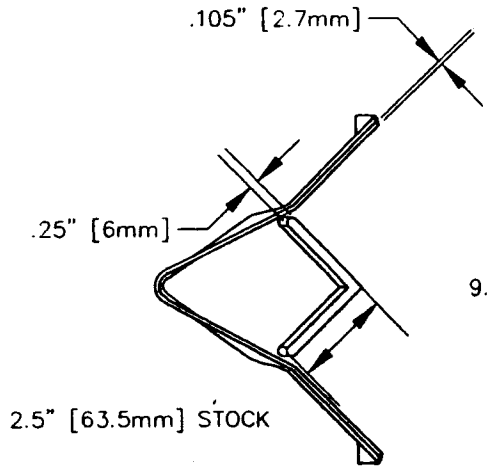
title | size: B

30007 | 1/1 | C

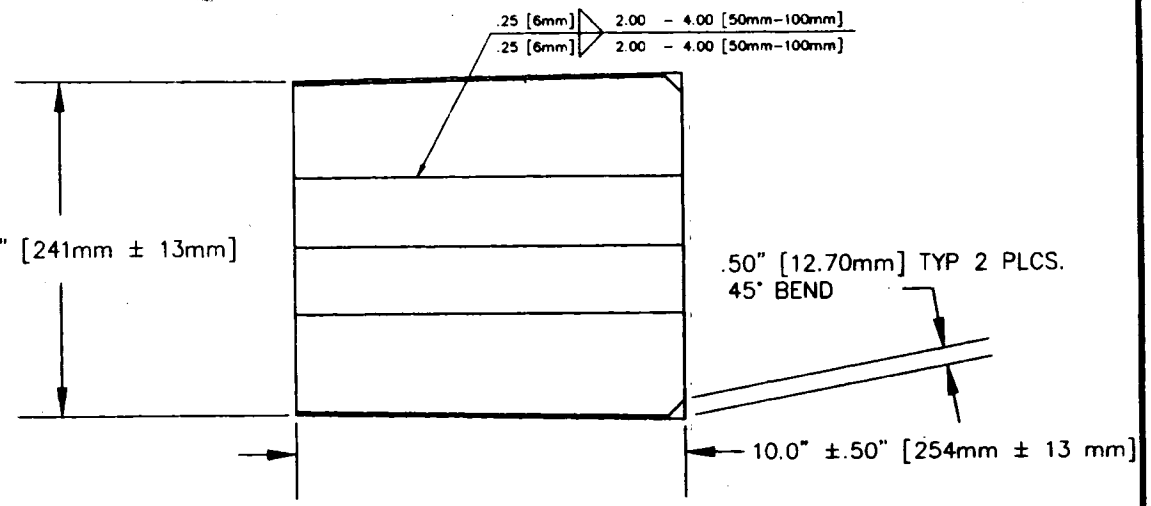
number | rev

C:\ ACLTWIN\FORSIGHT\HIGHWAY\30007


.105" [2.7mm]
.25 [6mm] 2.00 - 4.00 [50mm-100mm]
.25 [6mm] 2.00 - 4.00 [50mm-100mm]
A
A
9.5" ±.50" [241mm ± 13mm]
10.0" ±.50" [254mm ± 13 mm]
TOP VIEW
30.0" ±.50" [752mm ±13mm]
FRONT VIEW
7.0" ± .50" [178mm ±13mm]
.25 [6mm]
ø.75 [ø19mm] HOT ROLLED ROUND BAR
.25 [6mm]
13.5" ± .50" [343mm ± 13mm]
SIDE VIEW
.25" [6mm]
2.5" [63.5mm] STOCK
SECTION A-A
C 159 12/10 1996 MG ADDED CLEAN OUT BAR TO TOP AND SIDE VIEWS
B 156 10/17 1996 MG ADDED METRIC DIMENSION
A 142 4/1 1996 MG REMOVED SCALE\CORRECTED FIN DIM. CHANGED PROFILE ON FINS PER TTI
3/21 1996 MG DRAWING ORIGINATION
REV ECN DATE BY DESCRIPTION
DIMENSIONS AS NOTED
tolerances
X ±.10
XX ±.050
XXX ±.250
XXXX ±.125
PLATES HR. STEEL ASTM A-569
ANGLE \ BAR ASTM A-36 OR EQ.
material
scale:
approved by TJ
checked by TB
drawn by MG
FORESIGHT PRODUCTS inc
(303) 298-8885
V-LOC SIGN SUPPORT SOCKET FOR U-CHANNEL
title
20048 1/1 C
number rev



TOP VIEW



FRONT VIEW

REV	ECN	DATE	BY	DESCRIPTION
		4/5 1996	MG	DRAWING ORIGINATION

DIMENSIONS AS NOTED

tolerances UNLESS OTHERWISE SPECIFIED
X. ± 1.0
X.X ± .500
X.XX ± .250
X.XXX ± .125

PLATES HR. STEEL ASTM A-569
ANGLE \ BAR ASTM A-36 OR EQ.

material | scale:

approved by TJ

checked by TB

drawn by MG

FORESIGHT PRODUCTS inc
(303) 286-8955

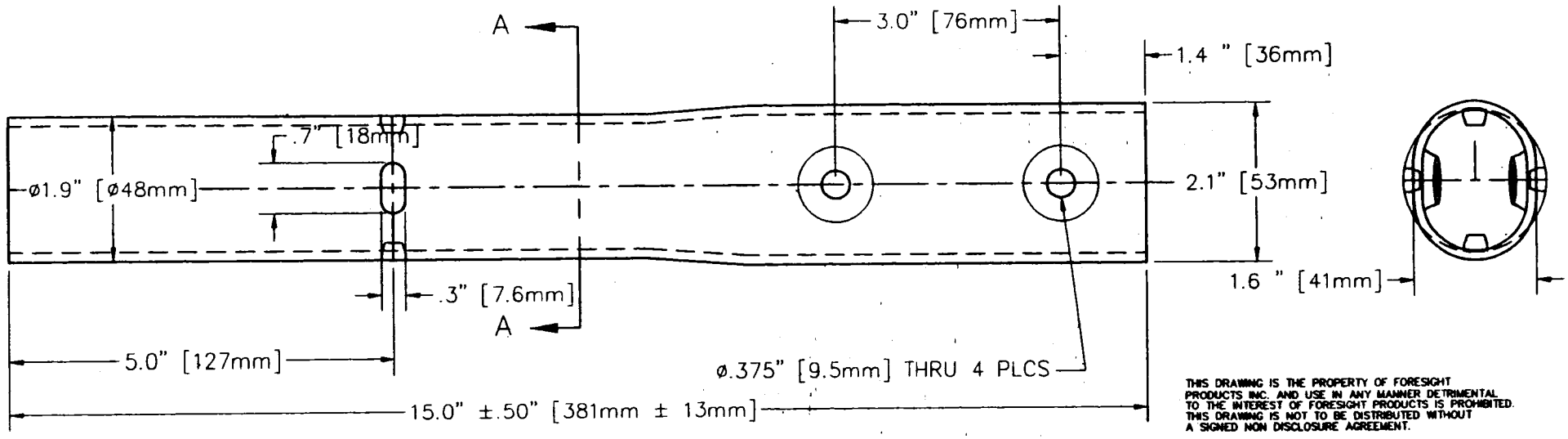
V-LOC SIGN SUPPORT SOCKET FOR U-CHANNEL IN CONCRETE

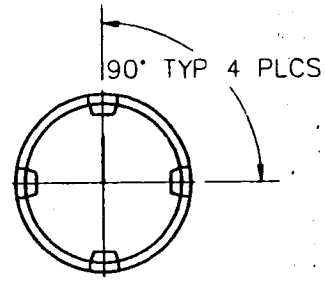
title | dwg SIZE: B

20075 1/1

number | rev

C:\ADLTRN\FORSIGHT\SIGNAY\20075\





SECTION A–A

REV	ECN	DATE	BY	DESCRIPTION
B	156	10/24 1996	MG	ADDED METRIC DIMENSION
A	142	4/1 1996	MG	REMOVED SCALE
		3/22 1996	MG	DRAWING ORIGINATION

DIMENSIONS AS NOTED

tolerances
UNLESS OTHERWISE SPECIFIED
X. ± .250
X.X ± .125
X.XX ± .060
X.XXX ± .030

11 GAUGE ROUND MECH TUBING; ZINC FLOW COAT AS TO ASTM A-500-B OR EQ

material | scale:

approved by TJ

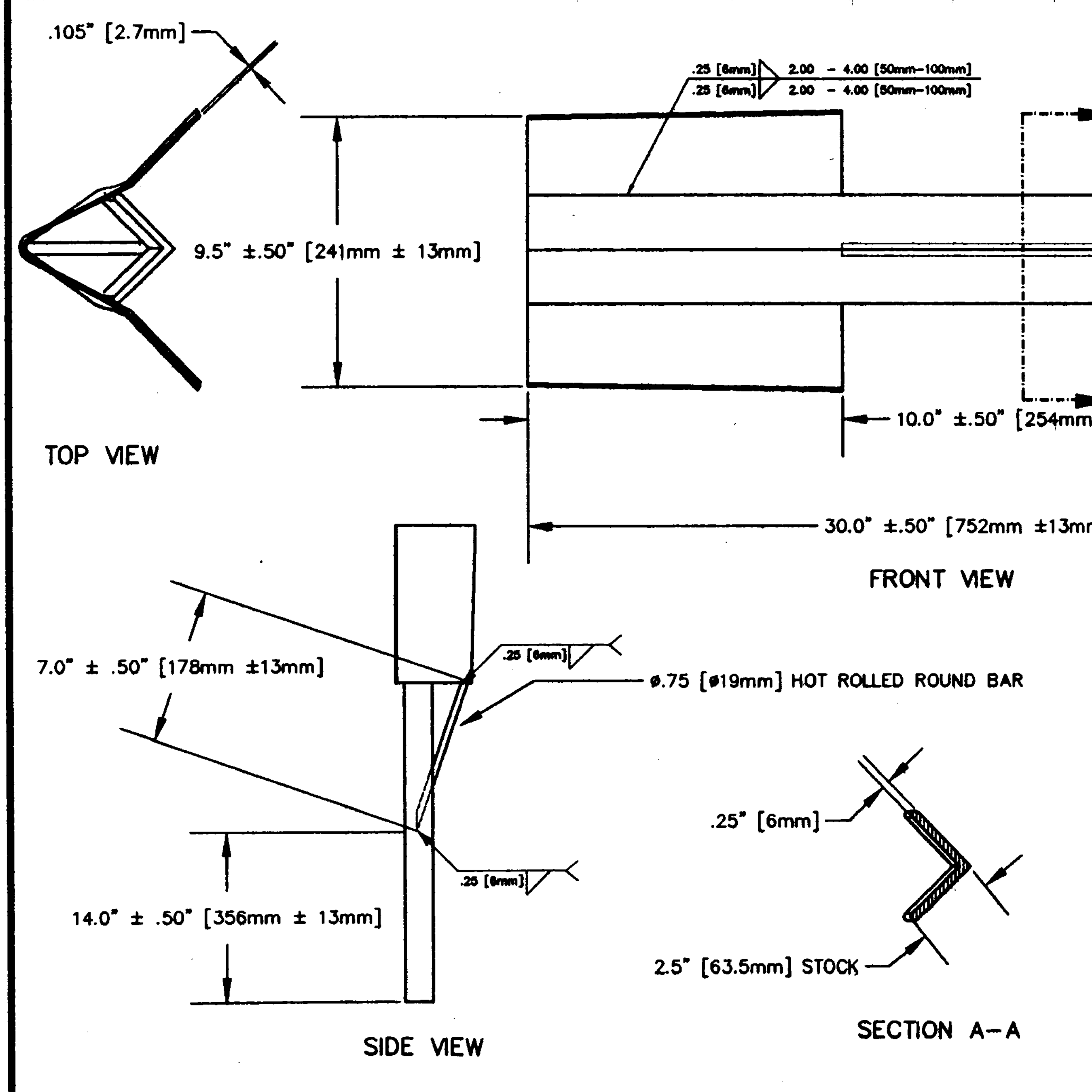
checked by TB

drawn by MG

FORESIGHT PRODUCTS inc
(303) 286-8955

U-CHANNEL POST ADAPTOR

title	DWG SIZE: B
20052 1/1	B
number	rev



REV	ECN	DATE	BY	DESCRIPTION
C	159	12/10 1996	MG	ADDED CLEAN OUT BAR TO SIDE AND TOP VIEWS
B	156	10/17 1996	MG	ADDED METRIC DIMENSION
A	142	4/1 1996	MG	REMOVED SCALE\CORRECTED FIN DIM.
		3/21 1996	MG	DRAWING ORIGINATION

DIMENSIONS AS NOTED

tolerances
X ±1.0
X.X ±.500
X.XX ±.250
X.XXX ±.125

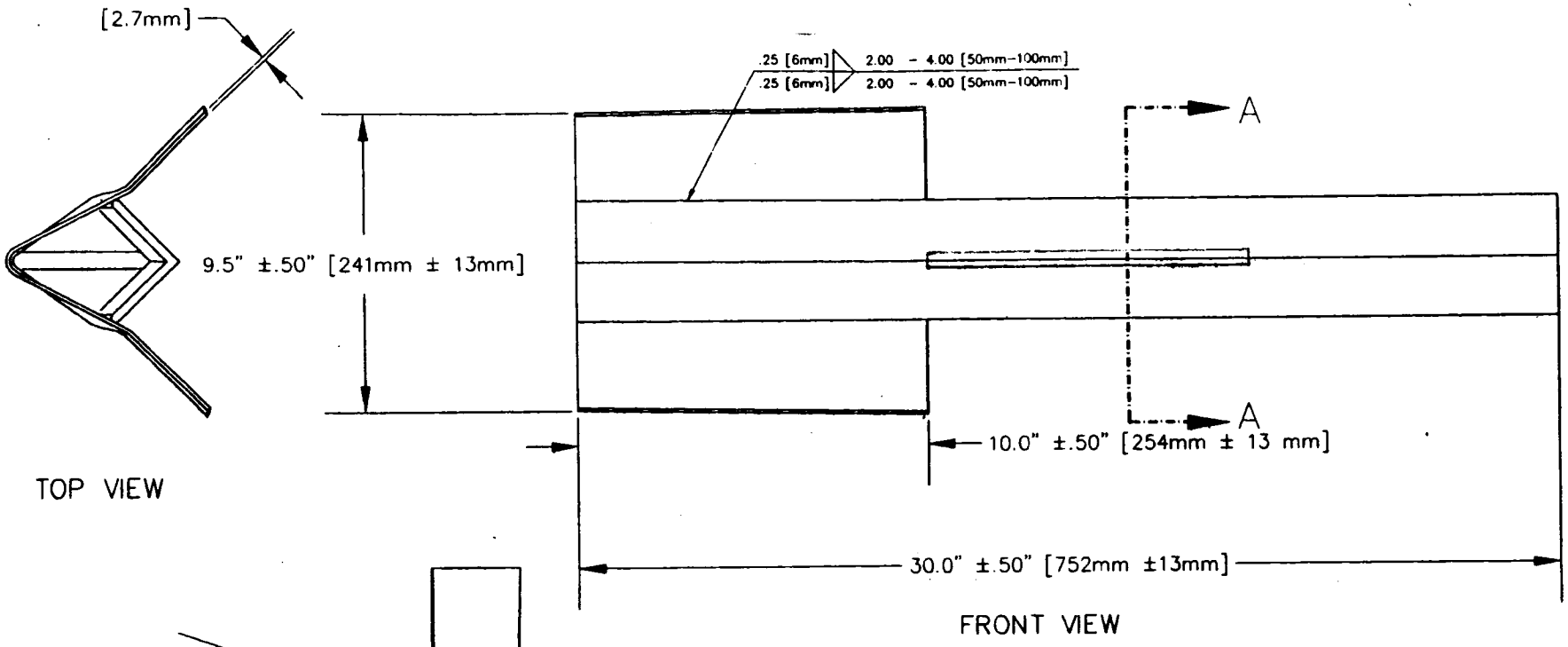
PLATES HR. STEEL ASTM A-569
ANGLE \ BAR ASTM A-36 OR EQ.

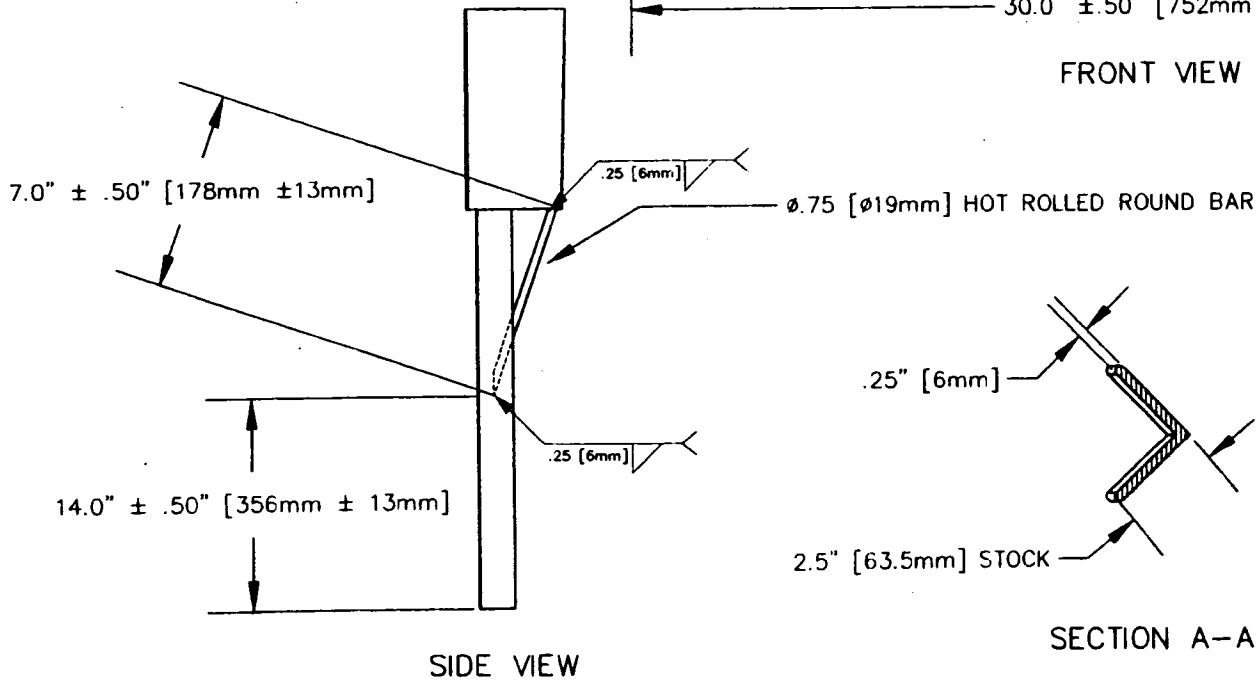
material | scale:
approved by TJ
checked by TB
drawn by MG

FORESIGHT PRODUCTS inc

V-LOC SIGN SUPPORT SOCKET FOR ROUND TUBE

title: 20050 | 1/1 | rev: C





REV	ECN	DATE	BY	DESCRIPTION
A	156	10/25 1996	MG	ADDED METRIC DIMENSION
		3/25 1996	MG	DRAWING ORIGINATION

DIMENSIONS IN INCHES

tolerances UNLESS OTHERWISE SPECIFIED
X. ±1.0
X.X ±.500
X.XX ±.250
X.XXX ±.125

PLATES (2) HR. STEEL ASTM A-569 ANGLE / BAR ASTM A-36 OR EQ.

material | scale: 1:1

approved by TED

checked by TJB

drawn by MG

FORESIGHT PRODUCTS inc
(303) 286-8955

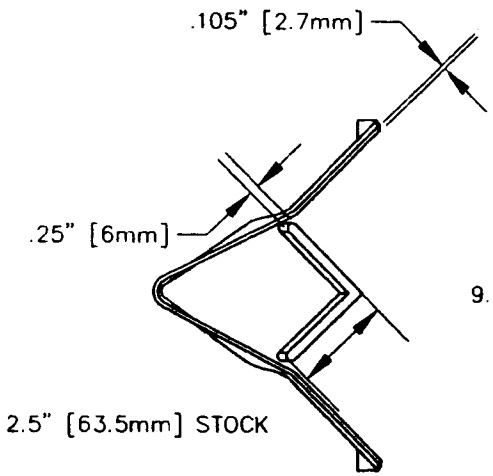
V-LOC SIGN SUPPORT SOCKET FOR PERFORATED SQUARE

title | DWG SIZE: B

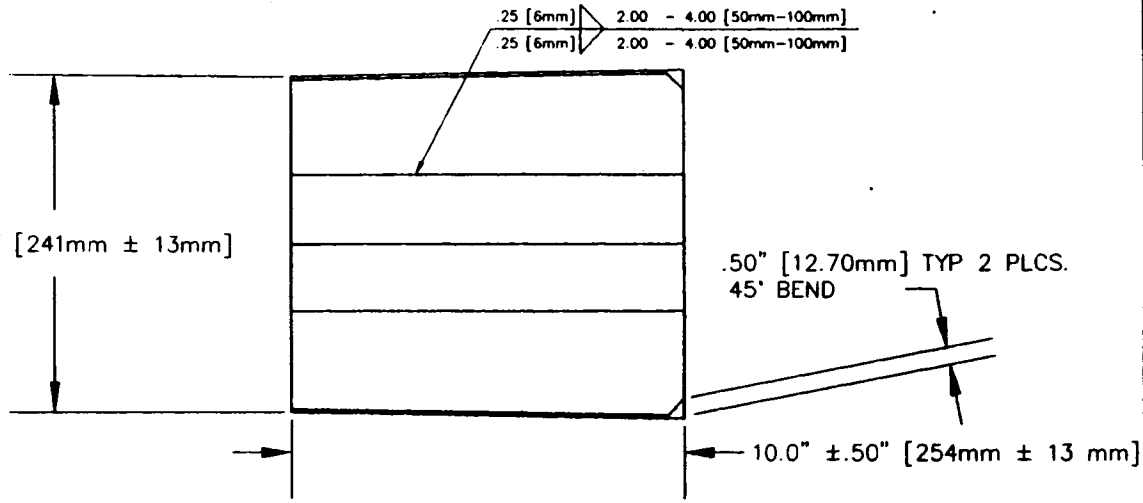
20054 | 1/1 | A

number | rev

C:\ ACLTRN\FORESIGHT\HIGHWAY\20054A\



TOP VIEW



FRONT VIEW

REV	ECN	DATE	BY	DESCRIPTION
		4/5 1996	MG	DRAWING ORIGINATION

DIMENSIONS AS NOTED

tolerances
UNLESS OTHERWISE SPECIFIED
X ±1.0
X.X ±.500
X.XX ±.250
X.XXX ±.125

PLATES
HR. STEEL
ASTM A-569
ANGLE \ BAR
ASTM A-36
OR EQ.

material | scale:

approved by TJ

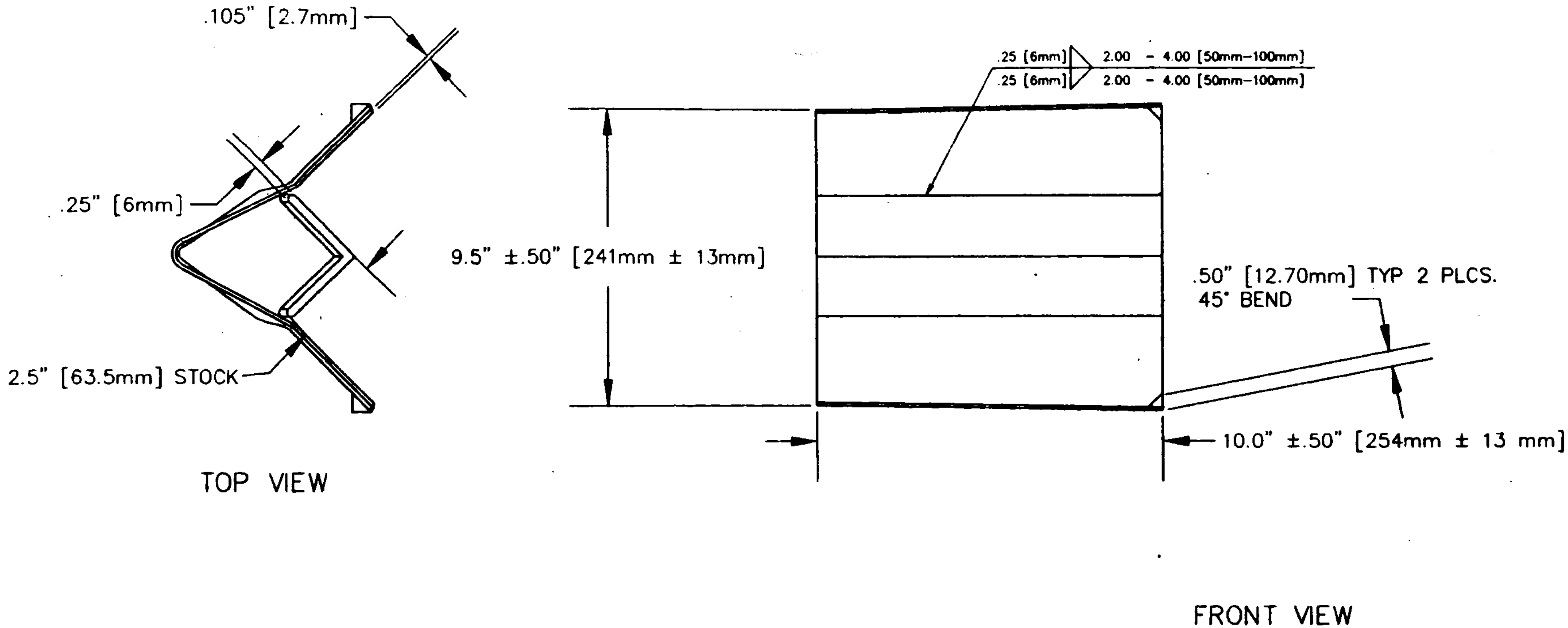
checked by TB

drawn by MG

FORESIGHT PRODUCTS inc
(303) 286-8955

V-LOC SIGN SUPPORT SOCKET FOR PERFORATED SQUARE IN CONCRETE

title	DWG SIZE: B
20077 1/1	
number	rev



REV	ECN	DATE	BY	DESCRIPTION
		4/5 1996	MG	DRAWING ORIGINATION

DIMENSIONS AS NOTED

tolerances UNLESS OTHERWISE SPECIFIED
X. ± 1.0
X.X ± .500
X.XX ± .250
X.XXX ± .125

PLATES HR. STEEL ASTM A-569
ANGLE \ BAR ASTM A-36 OR EQ.

material | scale:
approved by TJ
checked by TB
drawn by MG

FORESIGHT PRODUCTS inc
(303) 286-8955

V-LOC SIGN SUPPORT SOCKET FOR ROUND TUBE IN CONCRETE

title | DWG SIZE: B
20076 | 1/1
number | rev

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