The Commonwealth of Massachusetts

Construction and Traffic Standard Details

Massachusetts Highway Department

MASS HIGHWAY

Metric Edition

1996

The Commonwealth of Massachusetts

William F. Weld
Governor

Argeo P. Cellucci
Lieutenant Governor

James J. Kerasiotes
Secretary of Transportation

Laurinda T. Bedingfield
Commissioner

MASS HIGHWAY

Prepared by
The Massachusetts Highway Department

1996

MASSHIGHWAY
Office of the Commissioner

William F. Weld, Governor
Argeo Paul Cellucci, Lieutenant Governor
James J. Kerasiotes, Secretary
Laurinda T. Bedingfield, Commissioner

February 1996

Dear Reader:

The Massachusetts Highway Department serves one of the broadest and most important functions in state government. The highway and bridge program supports and promotes the growth of the Massachusetts economy in a variety of ways. We are committed to quality in all of our endeavors.

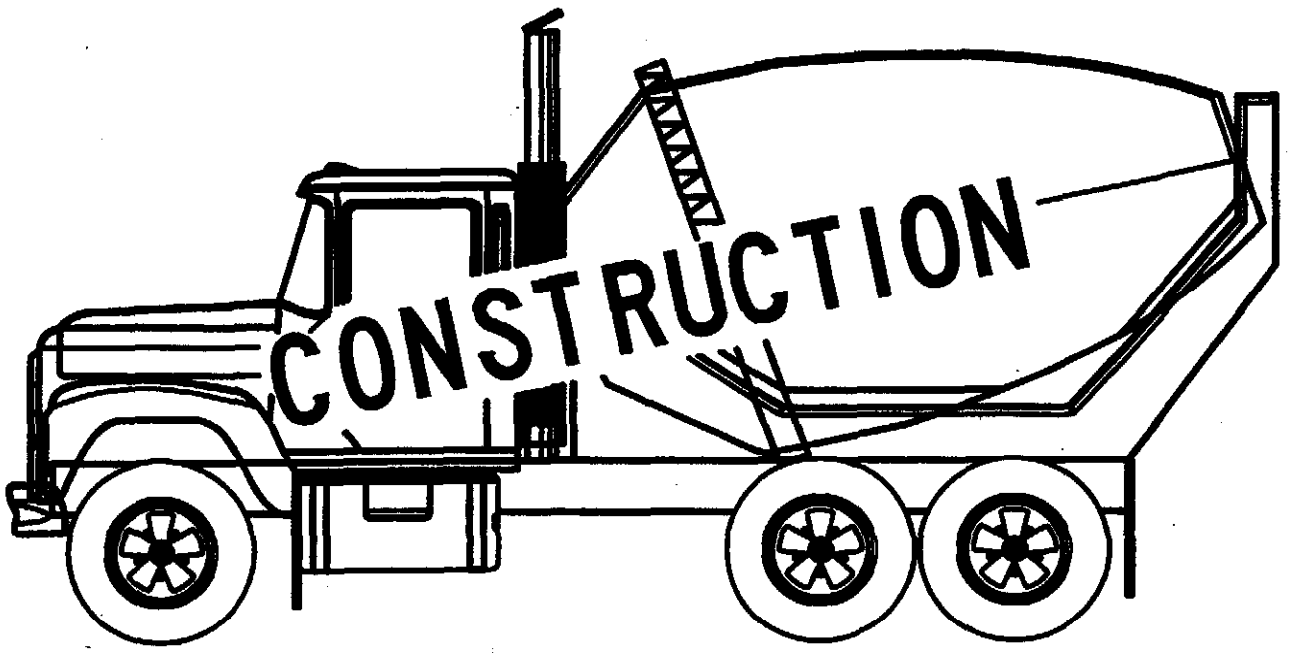
The 1996 Massachusetts Highway Department Construction and Traffic Standard Details - Metric Edition has been designed as part of the Weld - Cellucci Administration's and MassHighway Department's commitment that the Infrastructure of Massachusetts be *retrofitted, revolutionary and ready* to meet the challenges of the New World Economy as well as the needs of the 21st Century.

The new metric edition incorporates both construction and traffic details in one manual. These standard details have been revised to insure that the highest quality of important highway and traffic elements are attained in both design and construction. Please take special note that while signs must be designed and specified in metric units, all sign legends are to remain in English units.

I hope that every reader finds the Construction and Traffic Standard Details- Metric Edition to be a *valuable tool and reference*. Since *Teamwork* and *Partnership* are Standards of MassHighway, I invite you to participate, to comment and to be part of our Commonwealth's continual improvement.

Sincerely,

Laurinda T. Bedingfield
Commissioner



MASS HIGHWAY
CONSTRUCTION
STANDARDS

EXAMPLE DRAWING NUMBER **201.1.0**

SECTION NUMBER (1,2,3,4 OR 5)
(100, 200, 300, 400 OR 500 SERIES)

- SECTION 1 (100 SERIES)
  - HIGHWAY DESIGN AND PAVEMENT DETAILS
- SECTION 2 (200 SERIES)
  - DRAINAGE
- SECTION 3 (300 SERIES)
  - CEMENT CONCRETE, MASONRY STANDARDS
- SECTION 4 (400 SERIES)
  - HIGHWAY GUARD RAIL AND FENCES
- SECTION 5 (500 SERIES)
  - MISCELLANEOUS

CATEGORY IN SERIES:

- 01 FOR CATCH BASINS
- 02 FOR MANHOLES
- 03 FOR DROP INLETS, ETC.

DRAWING NUMBER IN EACH CATEGORY

AUXILIARY DRAWING NUMBER:
A NUMBER OTHER THAN ZERO WILL APPEAR IN THIS POSITION WHEN IT IS SUBSEQUENTLY NECESSARY TO INSERT ONE OR MORE ADDITIONAL DRAWINGS BETWEEN TWO EXISTING DRAWING NUMBERS IN THE SAME CATEGORY.

MASS HIGHWAY CONSTRUCTION STANDARDS

KEY TO NUMBERING SYSTEM

DATE OF ISSUE 9/22/95

DRAWING NUMBER **KEY 1**

DESCRIPTION	DRAWING NUMBER

SECTION 1
HIGHWAY DESIGN AND PAVEMENT DETAILS

SECTION 2
DRAINAGE

MASS HIGHWAY CONSTRUCTION STANDARDS

TABLE OF CONTENTS

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DESCRIPTION	DRAWING NUMBER

SECTION 2 – CONTINUED
DRAINAGE

DESCRIPTION | DRAWING NUMBER

SECTION 2 – CONTINUED
DRAINAGE

SECTION 3
CEMENT CONCRETE & MASONRY STRUCTURES

SECTION 4
HIGHWAY GUARD RAIL & FENCES

DESCRIPTION | DRAWING NUMBER

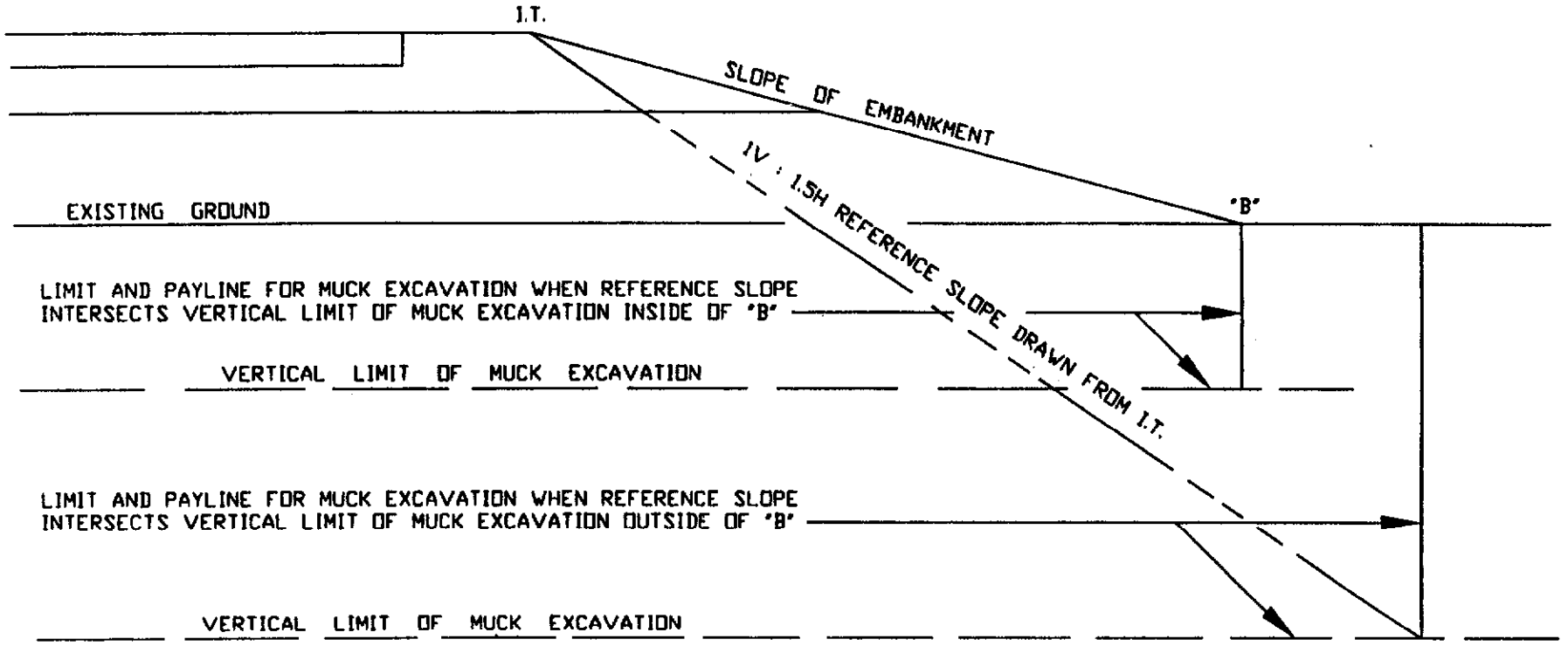
SECTION 4 – CONTINUED
HIGHWAY GUARD RAIL & FENCES

DESCRIPTION | DRAWING NUMBER

SECTION 5
MISCELLANEOUS

MASS HIGHWAY
CONSTRUCTION STANDARDS

LIMIT OF MUCK EXCAVATION



NOTES:

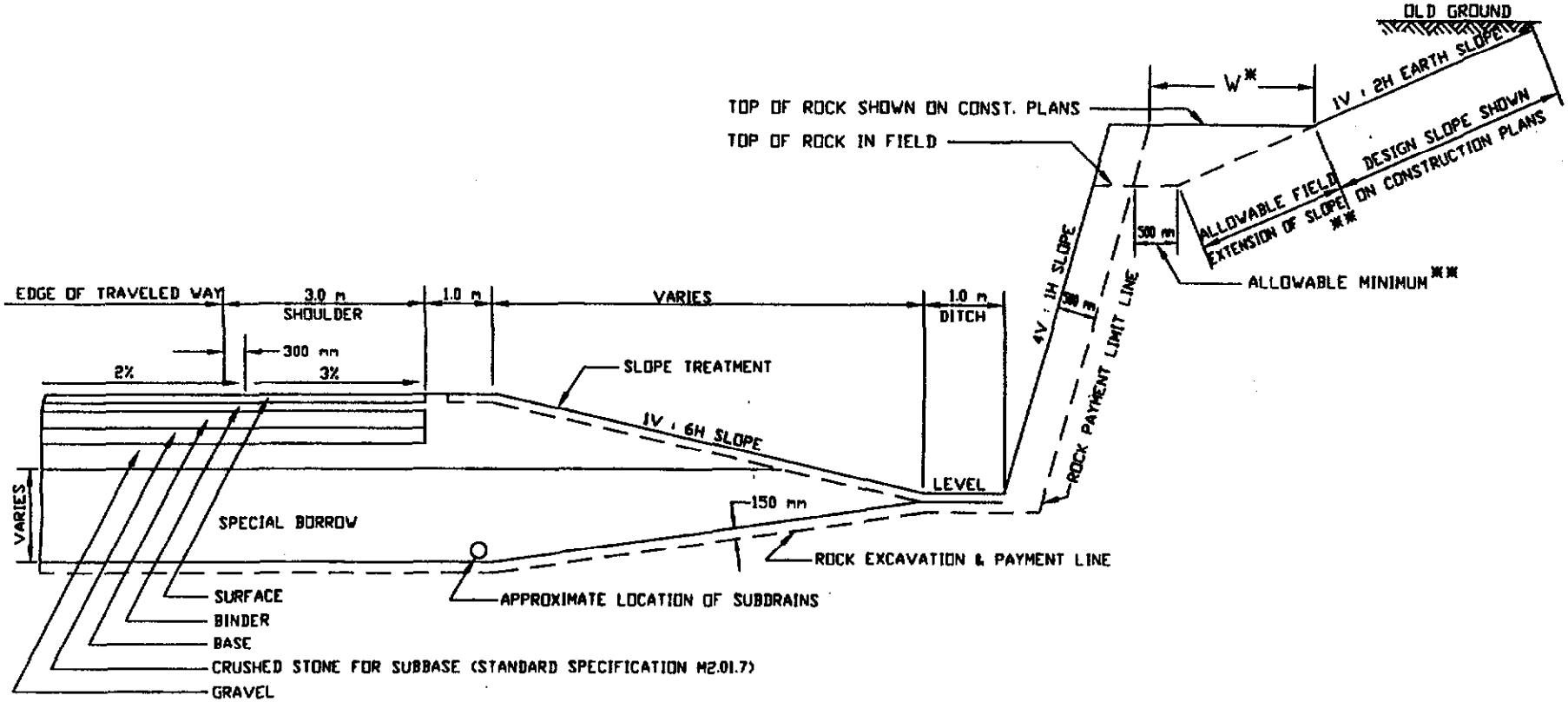
1. "B" - INTERSECTION OF EXISTING GROUND AND SLOPE OF EMBANKMENT
2. THE ABOVE METHOD MAY ALSO BE USED TO DETERMINE THE LIMIT FOR EXCAVATION OF OTHER UNSUITABLE MATERIALS
3. I.T. - INTERSECTION OF TANGENT

DATE OF ISSUE 9/22/95

DRAWING NUMBER 101.1.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

ROCK CUT SECTION



* DESIGN
- W=3.5 m FOR ROCK CUTS OF 6 m OR LESS
- W=5 m FOR ROCK CUTS 7.5 m OR MORE
- W-VARIES 3.5 m - 5 m FOR ROCK CUTS BETWEEN 6 m - 7.5 m) DETERMINE PROPORTIONATELY

** THE EXTENSION OF THE DESIGN SLOPE IN THE FIELD IS PERMISSIBLE WITHIN THE LIMITS SHOWN (600 mm SHELF ON TOP OF THE ROCK), WHEN THE HEIGHT OF THE ROCK CUT IN THE FIELD IS LESS THAN THAT SHOWN ON THE CONSTRUCTION PLANS

NOTES:

1. ONLY ROCK ACTUALLY REMOVED IS PAYABLE. NO PAYMENT WILL BE MADE BEYOND THE ROCK PAYMENT LINE

DATE OF ISSUE 9/22/95

DRAWING NUMBER 102.1.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

METHOD OF ROUNDING SLOPES

CUT AND FILL SLOPES

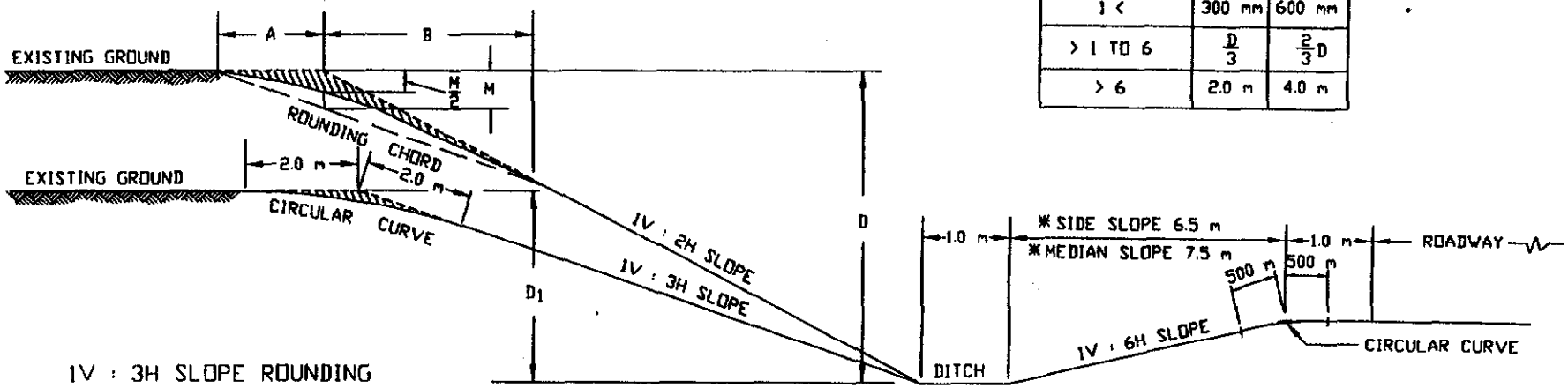
DATE OF ISSUE 9/22/95

DRAWING NUMBER 103.1.0

METHOD OF ROUNDING CUT SLOPES

ROUNDING TABLE FOR 1V : 2H SLOPE

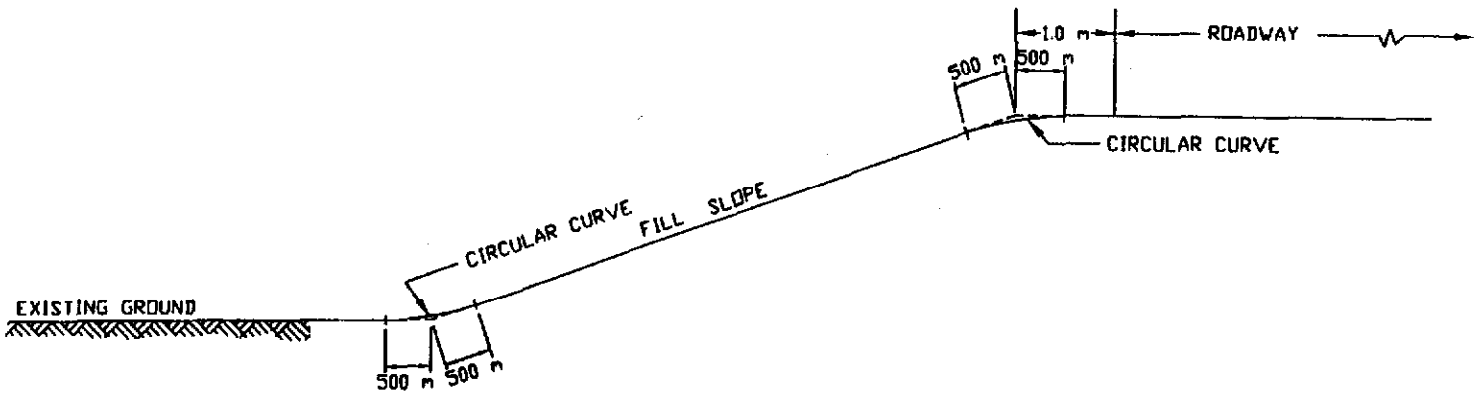
D METERS	A	B
1 <	300 mm	600 mm
> 1 TO 6	$\frac{D}{3}$	$\frac{2}{3}D$
> 6	2.0 m	4.0 m



1V : 3H SLOPE ROUNDING

1. WHEN "D1" IS 500 mm OR MORE ROUND AS SHOWN IN TABLE ABOVE.
2. WHEN "D1" IS LESS THAN 500 mm ROUND FULL LENGTH OF SLOPE.

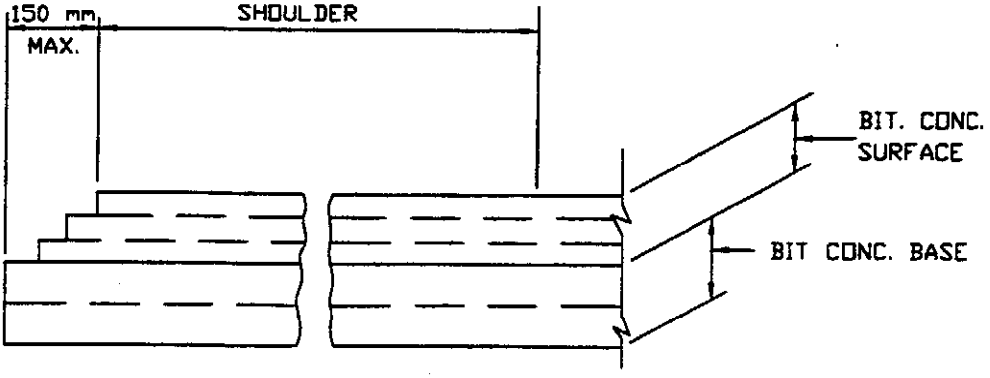
METHOD OF ROUNDING FILL SLOPES



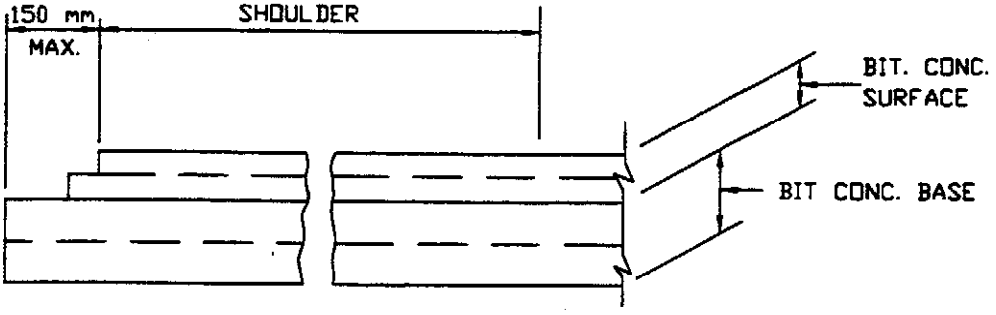
* USE SLOPE LENGTHS FOR LIMITED ACCESS OR HIGH SPEED ROADWAYS.

NOTE:

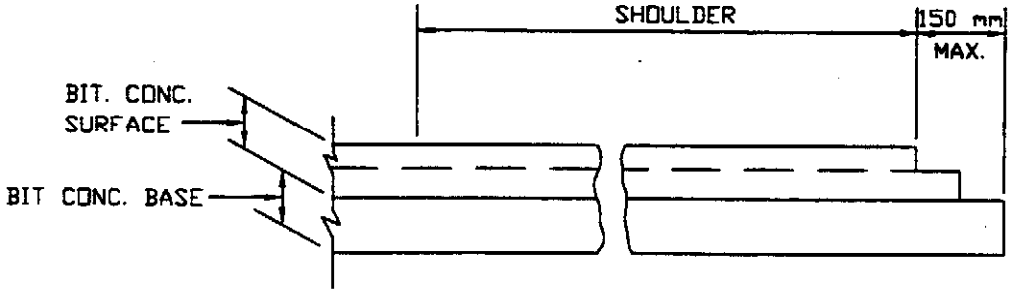
1. THE DIMENSIONS SHOWN FOR ROUNDING CUT AND FILL SLOPES ARE APPROXIMATE; THEY ARE TO BE USED AS GUIDES.



3 - LAYERED SURFACE AND 2 - LAYERED BASE COURSE



2 - LAYERED SURFACE AND 2 - LAYERED BASE COURSE



2 - LAYERED SURFACE AND 1 - LAYER BASE COURSE

NOTES:

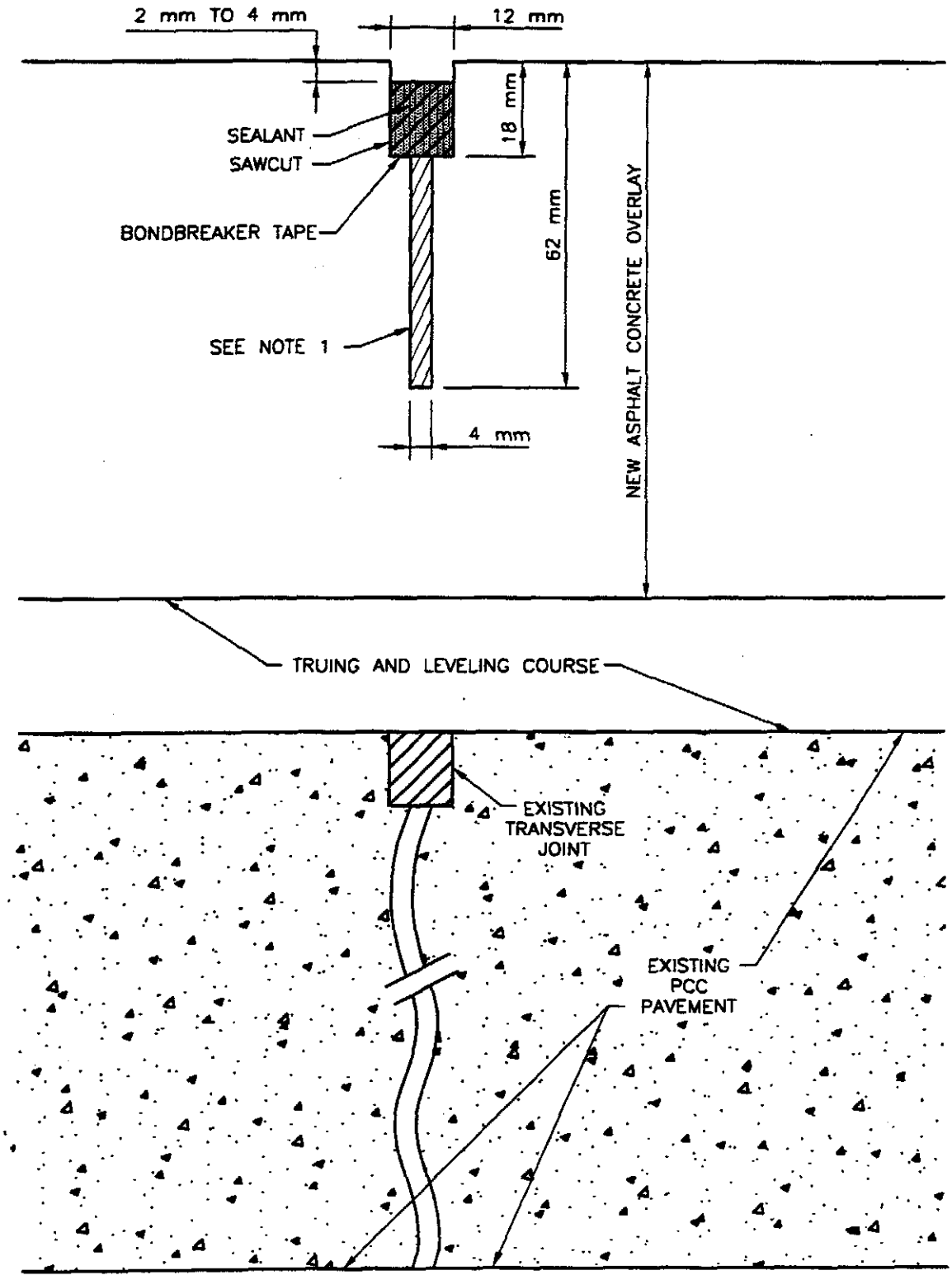
1. ONLY APPLICABLE STEPPING METHODS OF THIS DRAWING ARE TO BE SHOWN IN THE TYPICAL SECTION OF THE CONSTRUCTION PLANS. THIS SHALL BE SHOWN AS A SEPARATE DETAIL AND NOT INCLUDED ON EACH SECTION.
2. STEPPING SHALL NOT BE SHOWN ON THE CROSS SECTION TEMPLATES.
3. ADDITIONAL MATERIAL REQUIRED FOR STEPPING SHALL BE INCLUDED IN ESTIMATED QUANTITIES.

MASS HIGHWAY CONSTRUCTION STANDARDS

METHOD OF STEPPING SURFACE AND BASE COURSE LAYERS

DATE OF ISSUE
9/22/95

DRAWING NUMBER
104.1.0



NOTES:

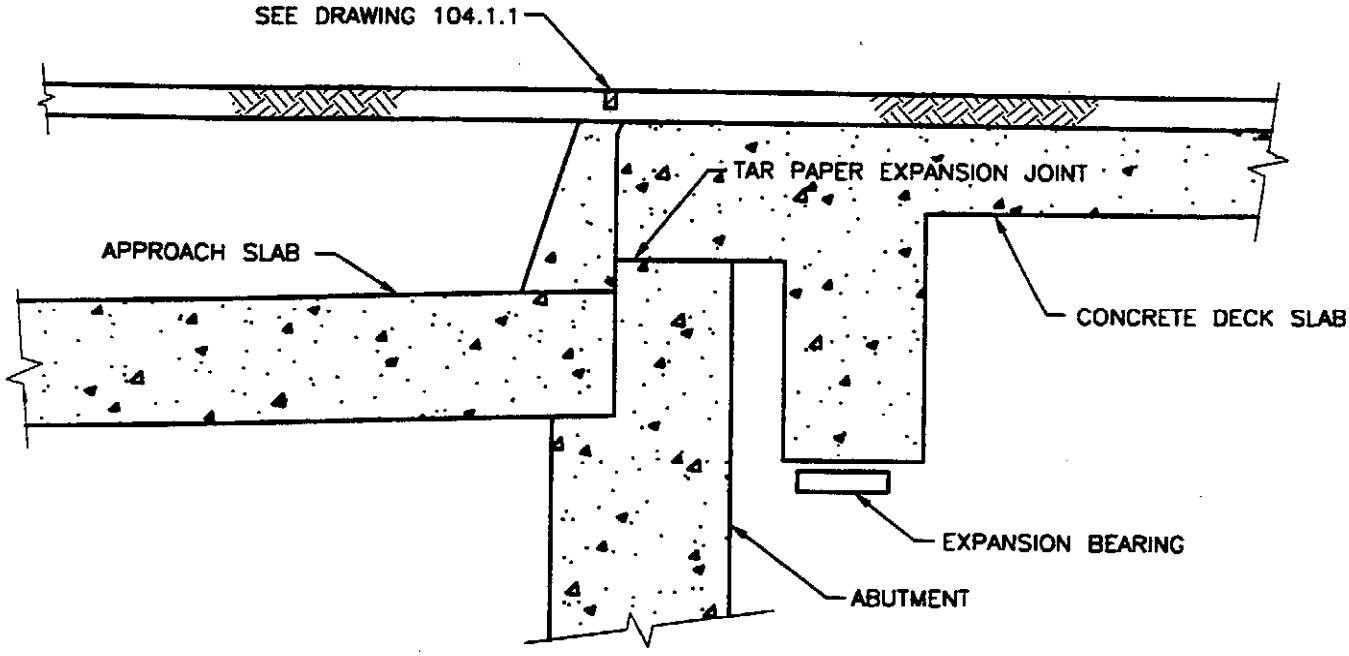
1. WHEN THE TOTAL THICKNESS OF ASPHALT CONCRETE OVER THE EXISTING JOIN EXCEEDS 112 mm, A 4 mm SAWCUT SHALL BE INCLUDED IN THE JOINT AS SHOWN TO A MINIMUM DEPTH OF 62 mm.
2. PRIOR TO PLACING THE OVERLAY, ALL JOINTS SALL BE LOCATED AND REFERENCED.

MASS HIGHWAY CONSTRUCTION STANDARDS

TRANSVERSE JOINTS AT EXPANSION JOINTS

DATE OF ISSUE 9/22/95

DRAWING NUMBER **104.1.1**



NOTES:

1. BEFORE SAW-CUTTING THE TRANSVERSE JOINT THE CONTRACTOR SHALL LOCATE THE END OF THE BRIDGE DECK. SAW-CUTTING MUST TAKE INTO ACCOUNT THE SKEW ANGLE OF THE BRIDGE.
2. ONLY EXPANSION JOINTS SHALL BE SAW-CUT AND SEALED.

MASS HIGHWAY CONSTRUCTION STANDARDS

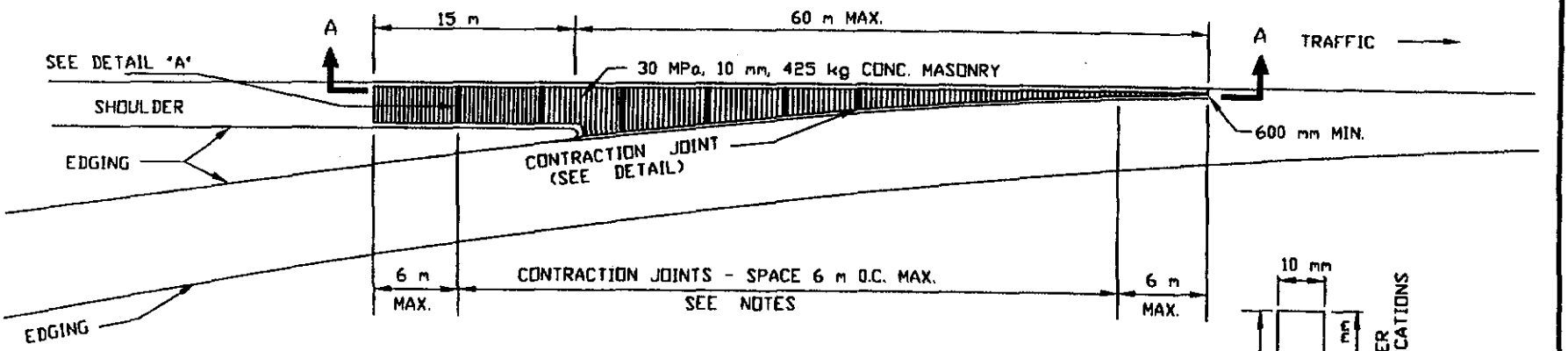
TRANSVERSE JOINTS AT BRIDGE ABUTMENT

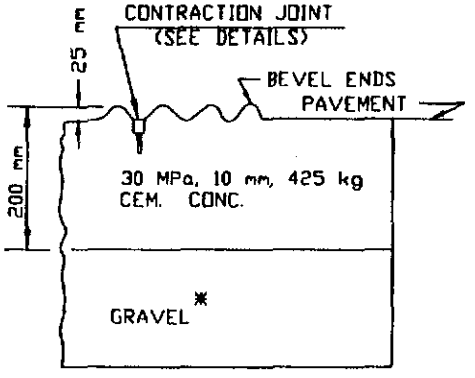
DATE OF ISSUE 9/22/95

DRAWING NUMBER **104.1.2**

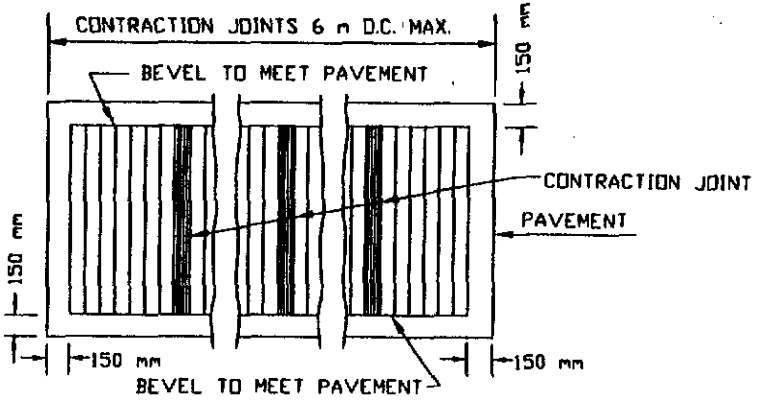
MASS HIGHWAY
CONSTRUCTION STANDARDS

SCORED CONCRETE PAVEMENT AT RAMPS

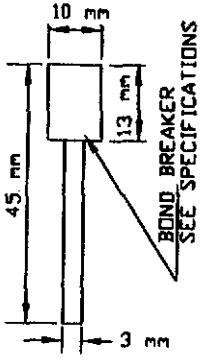




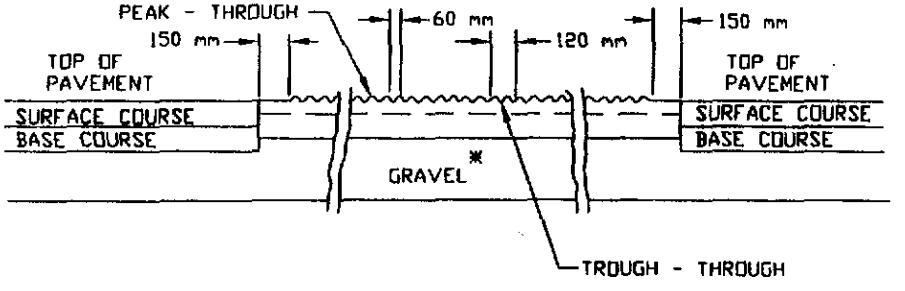
DETAIL OF CORRUGATIONS



DETAIL "A"



CONTRACTION JOINT DETAIL



SECTION A - A

* THE DEPTH OF THE GRAVEL IS TO BE SUCH THAT ITS BOTTOM LINE MEETS THE BOTTOM OF THE GRAVEL LINE OF THE CONTIGUOUS PAVEMENT.

NOTES:

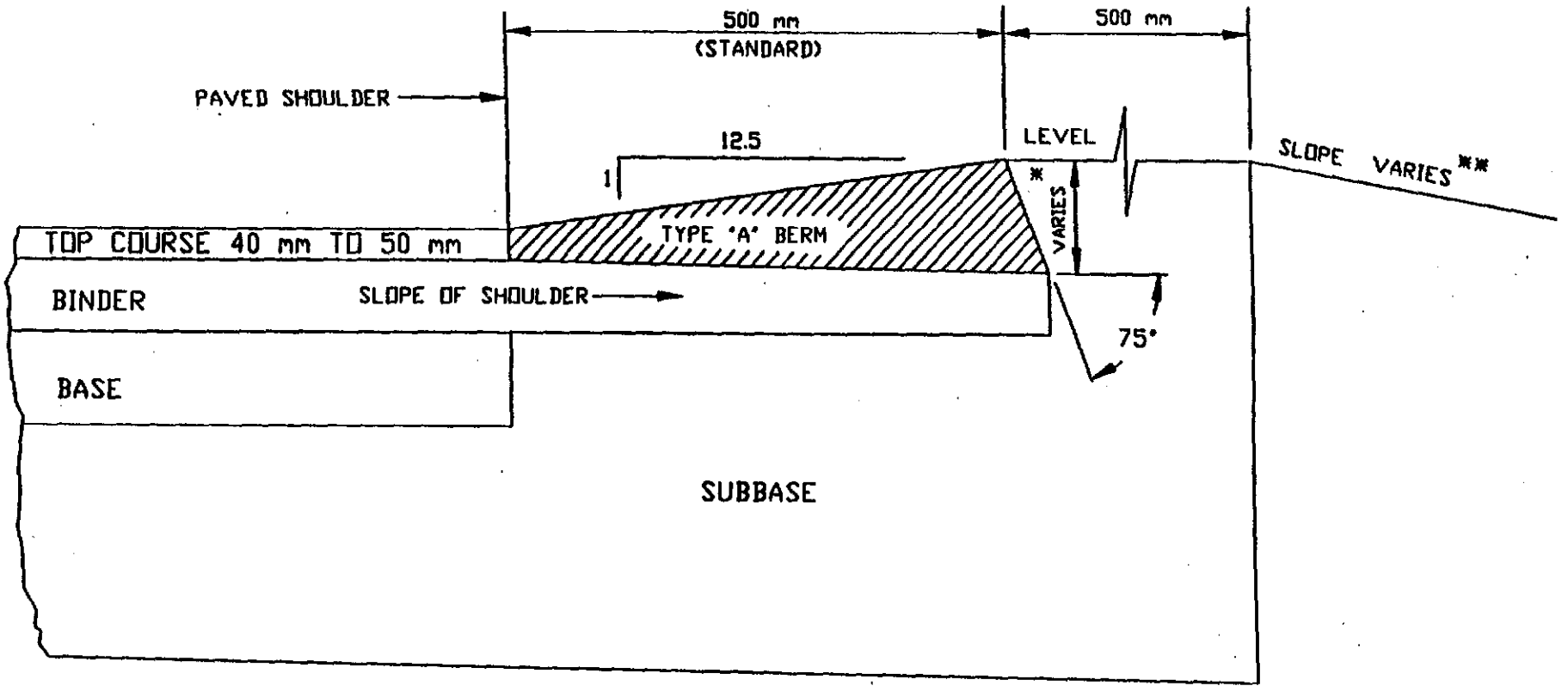
1. CONTRACTION JOINTS ARE TO BE SPACED AT A MAXIMUM OF 6 m APART.
2. THE JOINTS ARE TO BE SAWED AND LOCATED IN THE DEPRESSIONS OF THE CORRUGATIONS, SEE DETAIL OF CORRUGATIONS.
3. END OF CORRUGATED RIDGES TO BE BEVELED.
4. FOR DESCRIPTON OF MATERIAL AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS AND SPECIAL PROVISIONS.

DRAWING NUMBER
105.2.0

DATE OF ISSUE
9/22/95

MASS HIGHWAY
CONSTRUCTION STANDARDS

BITUMINOUS CONCRETE BERM
TYPE 'A'



NOTE: FOR MODIFIED BERM THE SLOPE REMAINS CONSTANT AT 1 (V) TO 12.5 (H)

* THIS DIMENSION VARIES WITH THE THICKNESS OF THE TOP COURSE AND SLOPE OF SHOULDER

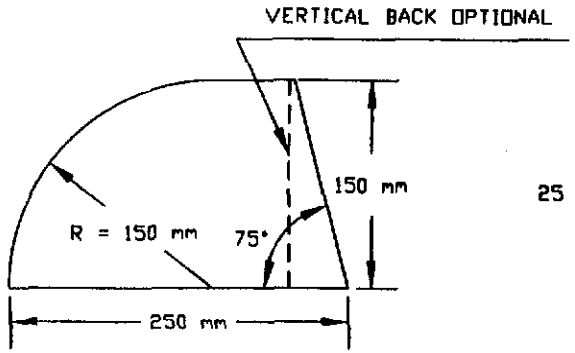
** SEE TYPICAL SECTIONS FOR PROJECT

DRAWING NUMBER **106.1.0R**

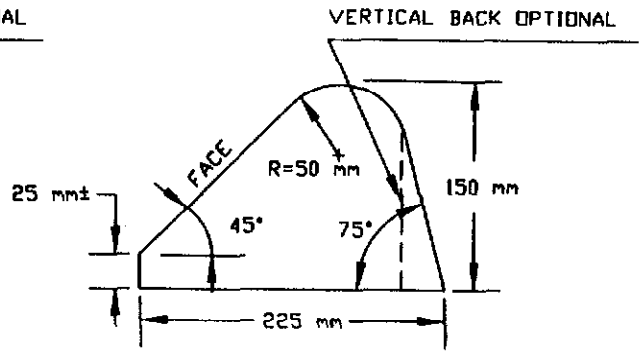
DATE OF ISSUE 2/3/97

MASS HIGHWAY
CONSTRUCTION STANDARDS

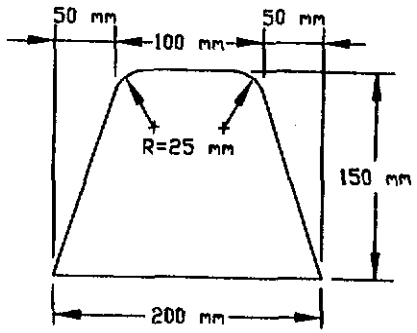
BITUMINOUS CONCRETE CURBS



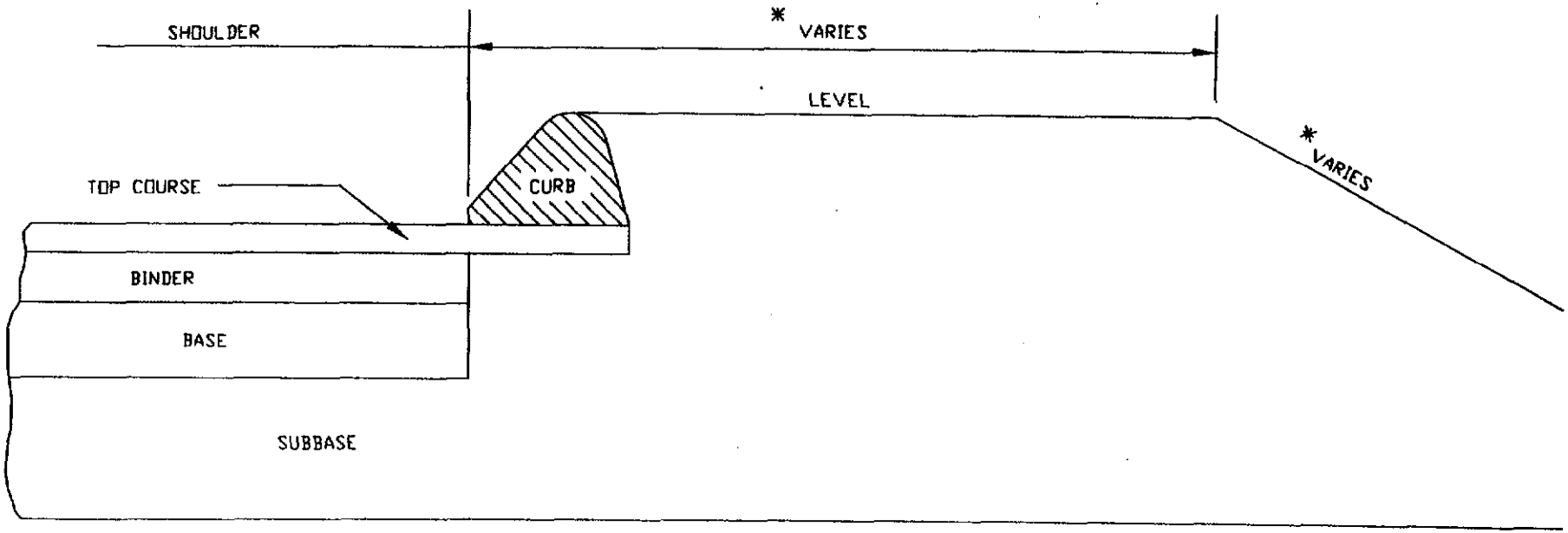
TYPE - 1



TYPE - 2



TYPE - 3



METHOD OF SETTING-TYPICAL FOR ALL TYPES

* SEE TYPICAL SECTIONS FOR PROJECT.

NOTE:

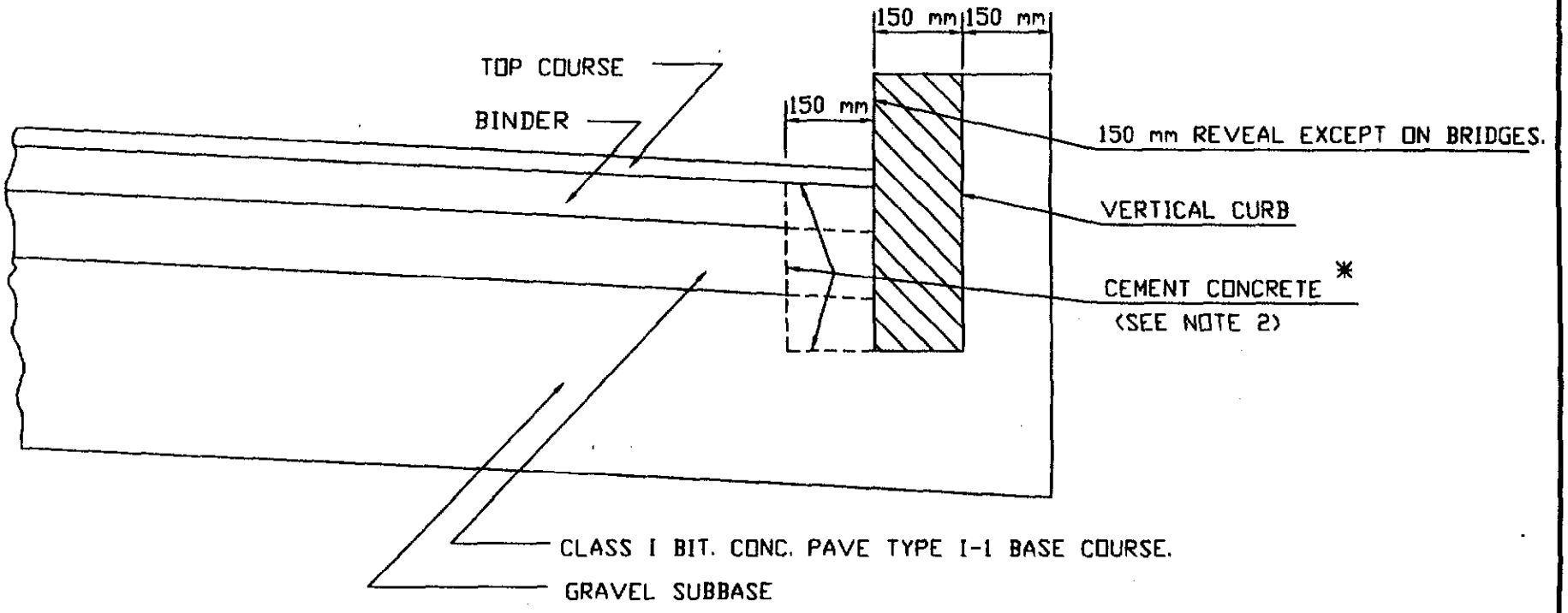
1. SEE DRAWING 106.1.0 FOR BITUMINOUS CONCRETE BERM.

DATE OF ISSUE 9/22/95

DRAWING NUMBER **106.2.0**

MASS HIGHWAY
CONSTRUCTION STANDARDS

METHOD OF SETTING VERTICAL CURB



* PROCEDURE DESCRIBED HEREIN IS APPLICABLE ONLY IF CURB IS TO BE SET AFTER BASE AND/OR BINDER COURSES ARE IN PLACE OTHERWISE CEMENT CONC. WILL BE ELIMINATED AND GRAVEL BROUGHT UP TO BOTTOM OF BASE COURSE. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE STANDARD SPECIFICATIONS.

NOTES:

1. CUT NEAT LINE 150mm FROM CURB LINE AND REMOVE BINDER, BASE AND STONE, REPLACE WITH CEMENT CONCRETE.
2. ANY DESIGNATED CEMENT CONCRETE THAT IS ACCEPTABLE TO THE DEPT. UNDER SECTION M4 OF THE STANDARD SPECIFICATIONS; ALL TEST REQUIREMENTS ARE WAIVED. BITUMINOUS CONCRETE IS NOT TO BE USED AS A SUBSTITUTE.
3. PAYMENT FOR CEMENT CONCRETE WILL BE INCLUDED IN THE PRICE PER METER OF CURBING.

DATE OF ISSUE 9/22/95

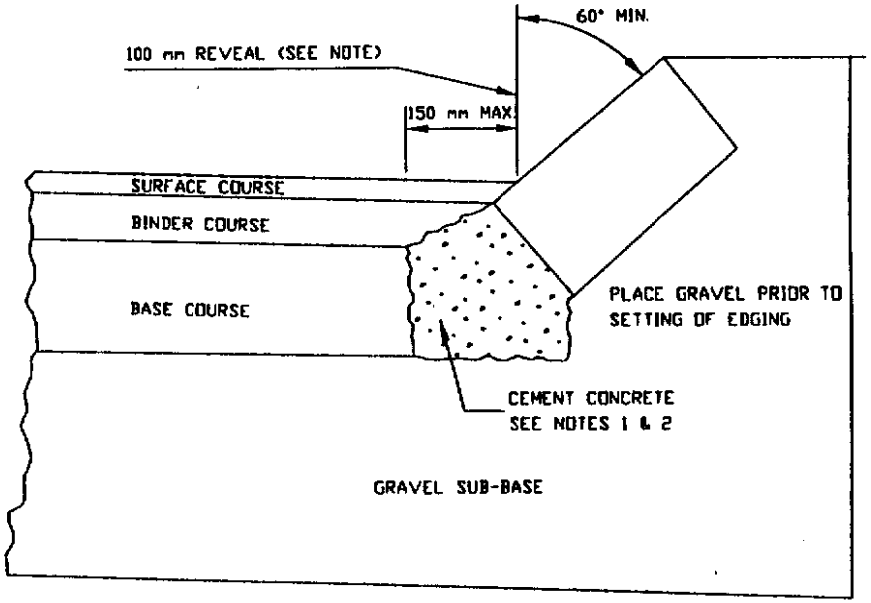
DRAWING NUMBER 106.3.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

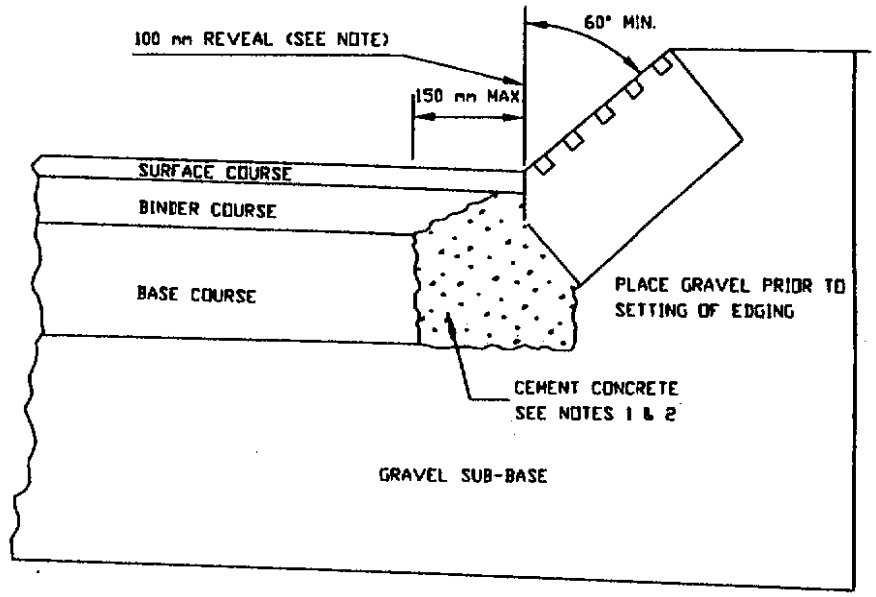
METHOD OF SETTING PRE-CAST CONCRETE AND GRANITE EDGING

DRAWING NUMBER 106.5.0

DATE OF ISSUE 9/22/95



SLOPED GRANITE EDGING



PRE-CAST EDGING

NOTES:

1. ANY DESIGNATED CEMENT CONCRETE THAT IS ACCEPTABLE TO THE DEPARTMENT UNDER SECTION M4 OF THE STANDARD SPECIFICATIONS; ALL TEST REQUIREMENTS ARE WAIVED. BITUMINOUS CONCRETE IS NOT TO BE USED AS A SUBSTITUTE.
2. PAYMENT FOR CEMENT CONCRETE WILL BE INCLUDED IN THE PRICE PER METER OF PRE-CAST OR GRANITE EDGING.
3. THE REVEAL IS TO BE 100 mm UNDER ALL CONDITIONS.

1. SIDEWALK CROSS SLOPES, AS INDICATED IN STANDARD SPECIFICATIONS, WILL BE 1.6% MAX, 1.5% PREFERRED FOR BRICK, CEMENT CONCRETE AND BITUMINOUS CONCRETE WITH EXCEPTION ONLY TO SIDEWALK CROSS SLOPES ON BRIDGES WHICH WILL BE 1%. (REFER TO STANDARD SPECIFICATIONS FOR HIGHWAY AND BRIDGES, SECTION 700.) **IN NO INSTANCE SHALL THE SIDEWALK CROSS SLOPE EXCEED 2%.**

2. AN UNOBSTRUCTED PATH OF TRAVEL WITH A MINIMUM WIDTH OF 915 mm SHALL BE MAINTAINED. THE DESIRABLE WIDTH IS 1.0 METER.

3. THE WHEELCHAIR RAMP SLOPE AND SIDE SLOPES (TRANSITION), 8% MAX, 7.5% PREFERRED, **MUST NOT EXCEED 1:12 (8.3%).** HOWEVER, SLOPES MAY BE FLATTER WHEN WARRANTED BY SURROUNDING CONDITIONS.

4. WHERE THE ROAD PROFILE EXCEEDS 5% THE HIGH SIDE CURB TRANSITION LENGTH (Lfh) SHALL BE 4.5 METERS.

5. IN NO CASE, WHERE A STOP LINE IS WARRANTED, SHALL A RAMP BE PLACED BEHIND THE STOP LINE.

6. FIXED OBJECTS (i.e. UTITLITY POLES, HYDRANTS, ETC.) MUST NOT ENCROACH ON ANY PART OF A WHEECHAIR RAMP.

7. AT NO TIME IS ANY PART OF THE WHEELCHAIR RAMP TO BE LOCATED OUTSIDE OF THE CROSSWALK AND IS TO BE CENTERED WHENEVER POSSIBLE.

8. CATCH BASINS WHICH ARE TO BE LOCATED IN THE VICINITY OF A WHEELCHAIR RAMP SHALL BE LOCATED UP-GRADE OF RAMP.

9. THE ENTRANCE OF A WHEELCHAIR RAMP SHALL BE FLUSH WITH THE ROADWAY.

10. **TESTING SURFACE.** WHEN TESTING WITH A STRAIGHTEDGE PLACED PARALLEL TO THE LINE OF SLOPE, THERE SHALL BE NO DEVIATION FROM A TRUE SURFACE IN EXCESS OF 6 mm.

11. **MID-BRIDGE WHEELCHAIR RAMP SHOULD BE AVOIDED** BECAUSE IT INTERRUPTS THE SIDEWALK REINFORCEMENT WHICH IS INTEGRAL TO THE STRENGTH OF THE RAILING/BARRIER SYSTEM AND BECAUSE THE STANDARD 200 mm CURB REVEAL WOULD RESULT IN EXCESSIVELY WIDE RAMPS. IF A MID-BRIDGE WHEELCHAIR RAMP IS UNAVOIDABLE, PRIOR APPROVAL OF THE BRIDGE ENGINEER MUST BE OBTAINED. SPECIAL DETAILING OF THE REINFORCEMENT AND CURB REVEAL WILL BE REQUIRED TO MAINTAIN THE PERFORMANCE OF THE RAILING/BARRIER SYSTEM. IN ALL CASES, ACCESSIBILITY WILL BE PROVIDED TO AND FROM THE BRIDGE SIDEWALK.

12. WHEN IT IS TECHNICALLY UNFEASIBLE TO CONSTRUCT WHEELCHAIR RAMPS IN COMPLIANCE WITH THE ARCHITECTURAL ACCESS BOARD'S RULES AND REGULATIONS, A REQUEST FOR A VARIANCE WILL NEED TO BE SUBMITTED. THE DEPARTMENT'S HANDICAPPED ACCESSIBILTY SECTION SHOULD BE CONTACTED FOR ASSISTANCE AND DOCUMENTATION.

MASS HIGHWAY CONSTRUCTION STANDARDS	WHEELCHAIR RAMP NOTES	DATE OF ISSUE 5/16/96 DRAWING NUMBER 107.1.0

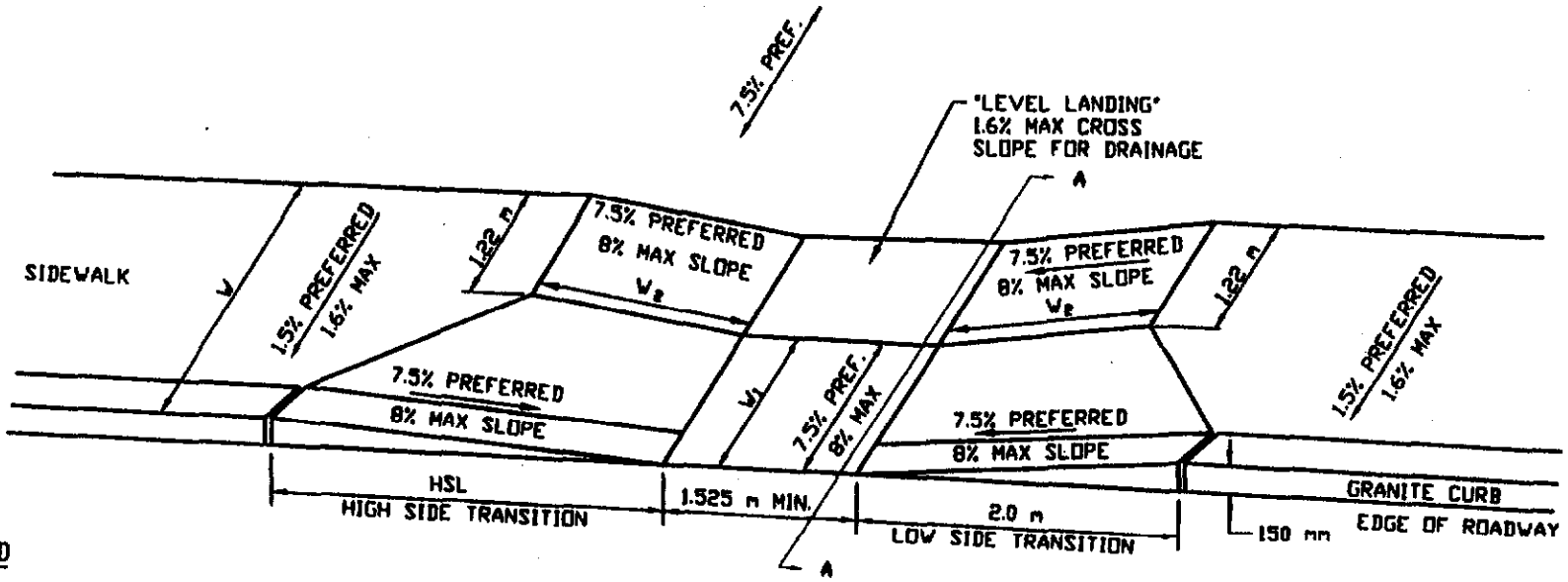
MASS HIGHWAY CONSTRUCTION STANDARDS

CEMENT AND BITUMINOUS CONCRETE WHEELCHAIR RAMPS

LESS THAN 3.52 m SIDEWALK

DATE OF ISSUE 5/16/96

DRAWING NUMBER 107.2.0



LEGEND

HSL = HIGH SIDE FRONT TRANSITION LENGTH (SEE 107.9.0)

Lbl = LOW SIDE BACK TRANSITION LENGTH (SEE TABLE III a&b)

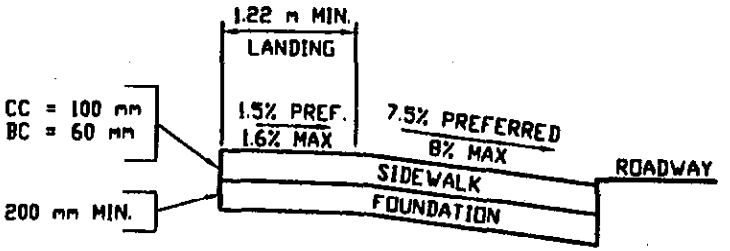
W = SIDEWALK WIDTH

W_1 = PERPENDICULAR RAMP LENGTH

W_2 = PARALLEL RAMP LENGTH

CC = CEMENT CONCRETE

BC = BITUMINOUS CONCRETE



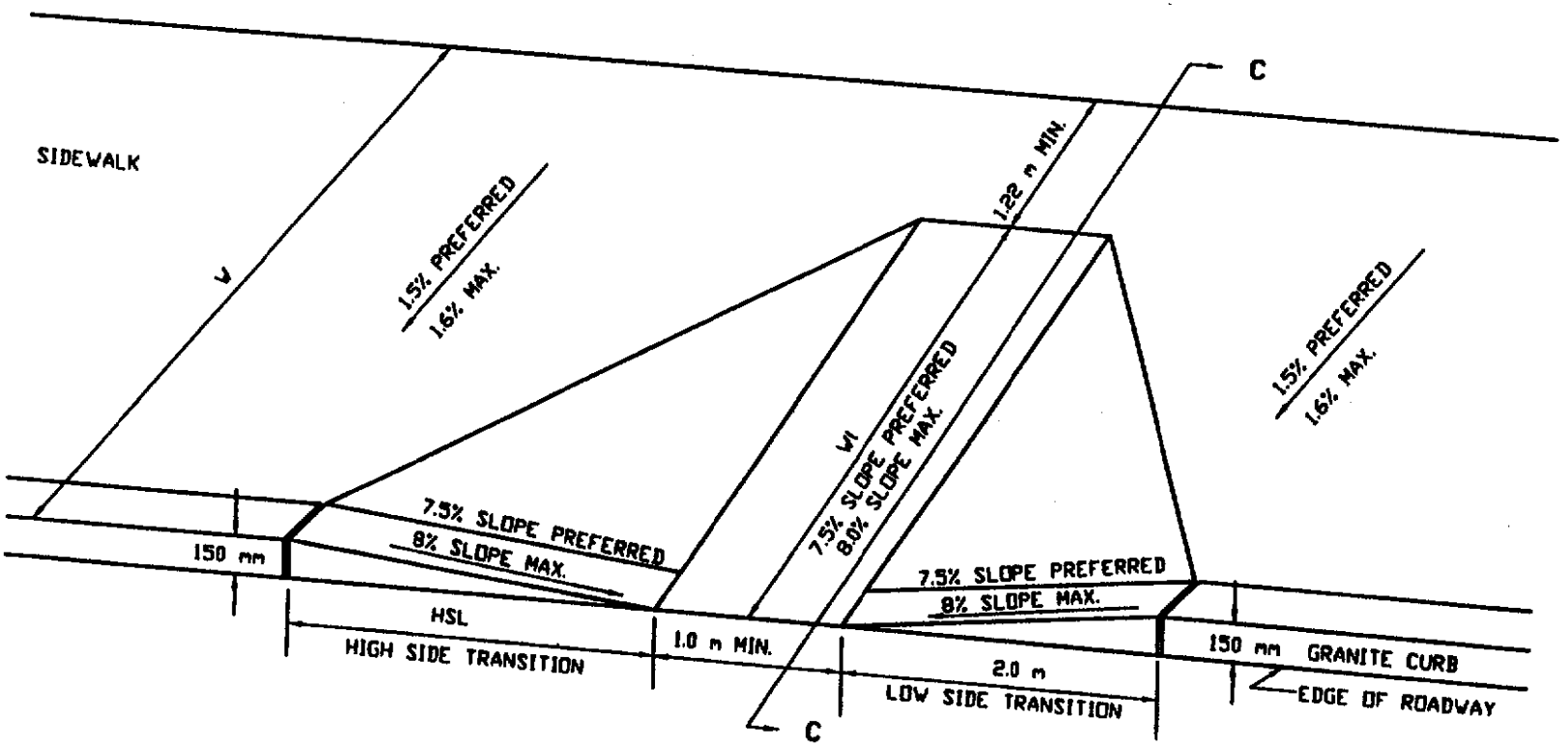
SECTION A-A

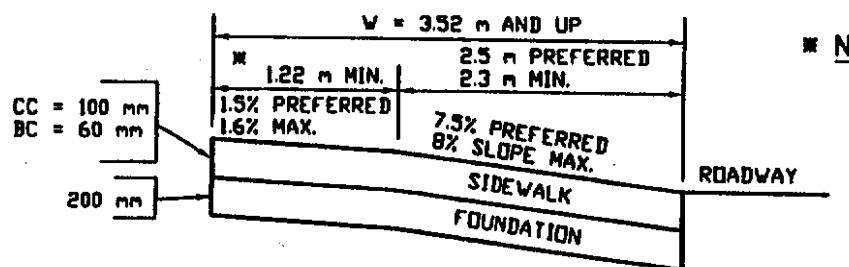
* WHERE THE SIDEWALK WIDTH IS 2.3m OR GREATER FOR BITUMINOUS CONCRETE AND 2.4m OR GREATER FOR CEMENT CONCRETE AND BRICK, THE BACK TRANSITION LENGTHS (Lbh, Lbl) SHALL EQUAL ZERO (0). THEREFORE THE DIAGONAL SCORE LINE SHALL MEET THE BACK CORNERS OF THE WHEELCHAIR RAMP. IT SHOULD BE NOTED THAT THE RAMP SLOPE SHALL BE LESS THAN 3.4m FOR BITUMINOUS CONCRETE AND GREATER THAN 2.4m TO LESS THAN 3.4m FOR CEMENT AND BRICK. (SEE TABLE IV)

MASSHIGHWAY
CONSTRUCTION STANDARDS

BRICK, CEMENT AND BITUMINOUS CONCRETE WHEELCHAIR RAMPS

3.52 m AND UP SIDEWALK





SECTION C-C

*** NOTE:**

THE LENGTH OF THE AREA BEHIND THE WHEELCHAIR RAMP LENGTH (WI) SHALL NOT BE LESS THAN 1.22 m AND SHALL INCREASE AS THE SIDEWALK INCREASES. IF THE CURB REVEAL SHOULD BE LARGER THAN 150 mm ALL WHEEL CHAIR RAMP DIMENSIONS MUST BE COMPUTED. IN AREAS OF BRICK SIDEWALK THE RAMP SURFACE WI SHALL BE CONSTURCTED OF CEMENT CONCRETE.

LEGEND

HSL = HIGH SIDE FRONT TRANSITION LENGTH (SEE 107.9.0)

W = SIDEWALK WIDTH

WI = PARRALLEL RAMP LENGTH

CC = CEMENT CONCRETE

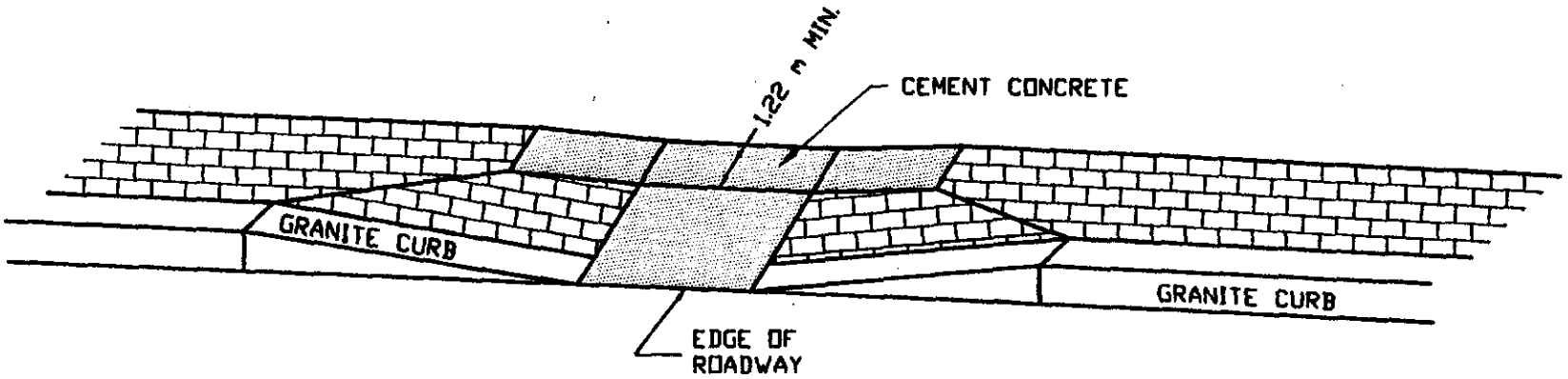
BC = BITUMINOUS CONCRETE

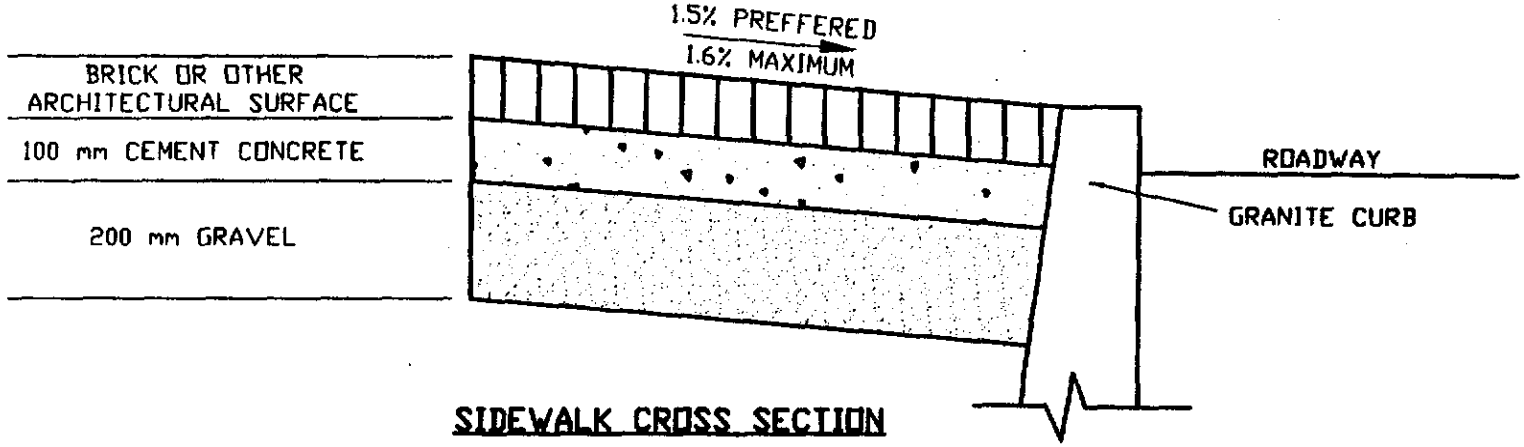
DATE OF ISSUE 5/16/96

DRAWING NUMBER **107.3.0**

MASS HIGHWAY CONSTRUCTION STANDARDS

BRICK WHEELCHAIR RAMP DETAIL





SIDEWALK CROSS SECTION

NOTES

1. IN AREAS OF BRICK SIDEWALKS, OR OTHER ARCHITECTURAL SIDEWALK TREATMENTS, CEMENT CONCRETE SHALL BE USED FOR ALL WHEEL CHAIR RAMP SURFACES.
2. FOR WHEEL CHAIR RAMP DETAILS AND DIMENSIONS SEE DRAWINGS FOR CEMENT CONCRETE WHEEL CHAIR RAMPS.
3. FOR BRICK OR OTHER ARCHITECTURAL WALK SURFACES, ANY VARIATION EXCEEDING 6 mm SHALL BE CORRECTED AND BROUGHT TO GRADE.
4. FOR BRICK WALK SURFACES JOINTS SHALL BE 8 mm TO 10 mm WIDE AND SHALL BE MORTARED.

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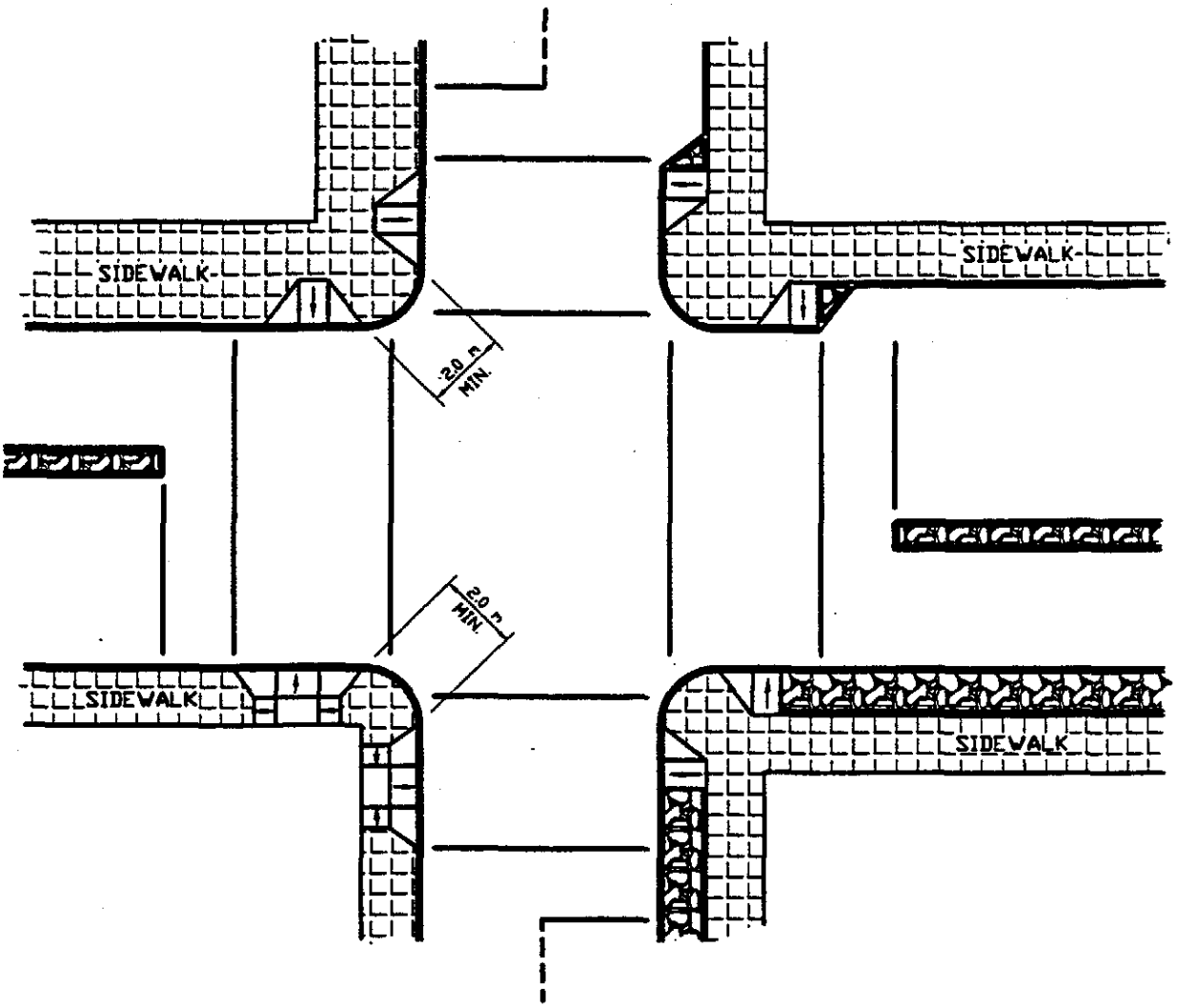
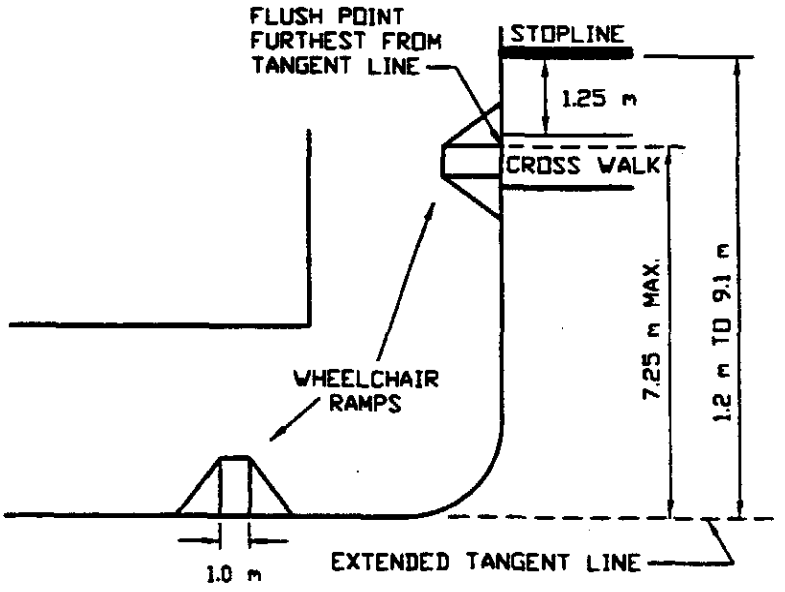
DRAWING NUMBER 107.4.0

THE FOLLOWING CROSSWALK PLAN MUST BE USED FOR ALL INTERSECTIONS.





MASS HIGHWAY CONSTRUCTION STANDARDS

PAIRED WHEELCHAIR RAMP CONDITION

DATE OF ISSUE 5/16/96

DRAWING NUMBER 107.5.0

MASS HIGHWAY CONSTRUCTION STANDARDS

WHEELCHAIR RAMP

FOR LIMITED RIGHT-OF-WAY AREAS WITH ONE CONTINUOUS DIRECTION OF PEDESTRIAN TRAVEL

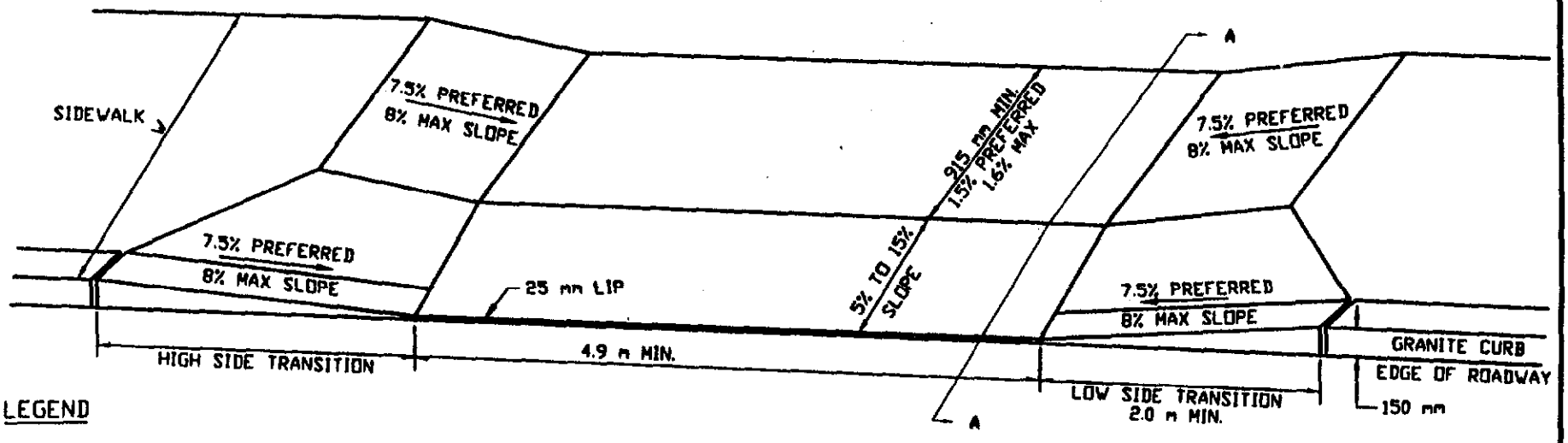
DATE OF ISSUE
5/16/96

DRAWING NUMBER
107.6.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

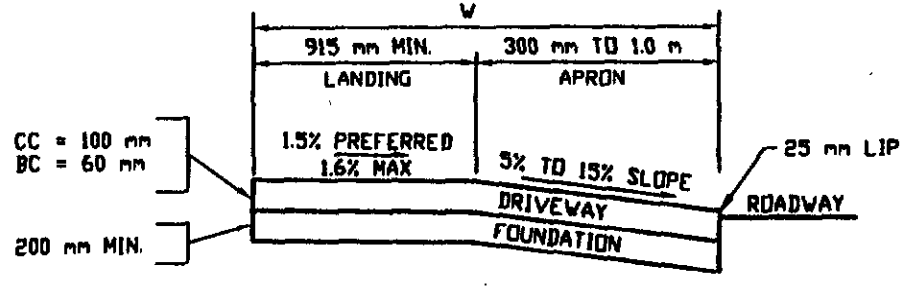
DRIVEWAYS

1.2 m TO 1.8 m SIDEWALK



LEGEND

W = SIDEWALK WIDTH



SECTION A-A

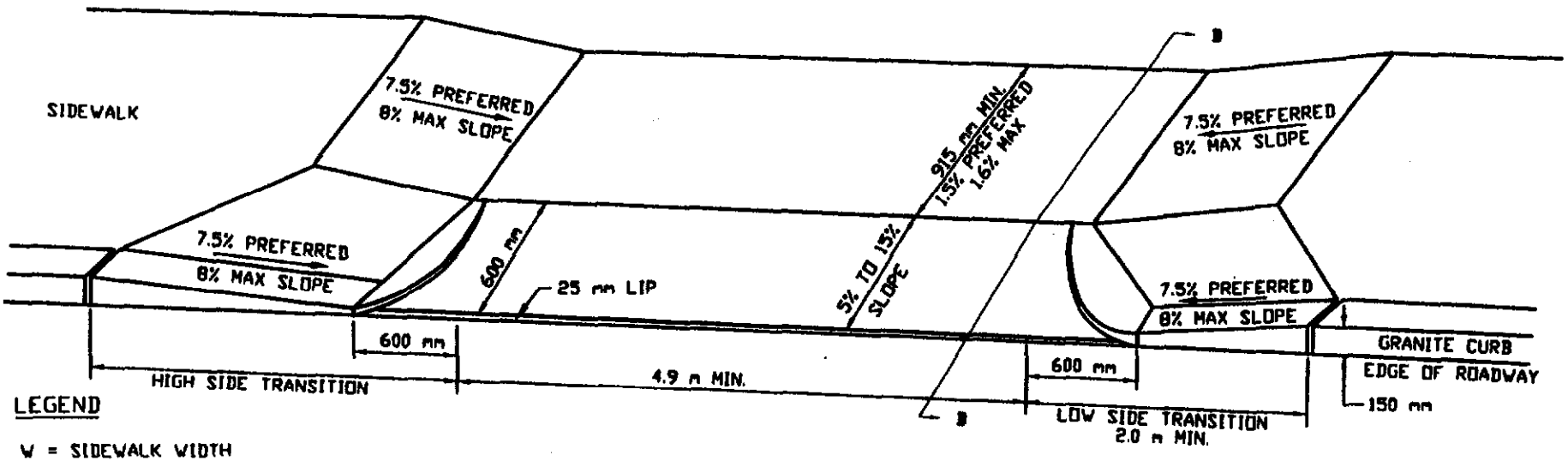
DATE OF ISSUE 5/16/96

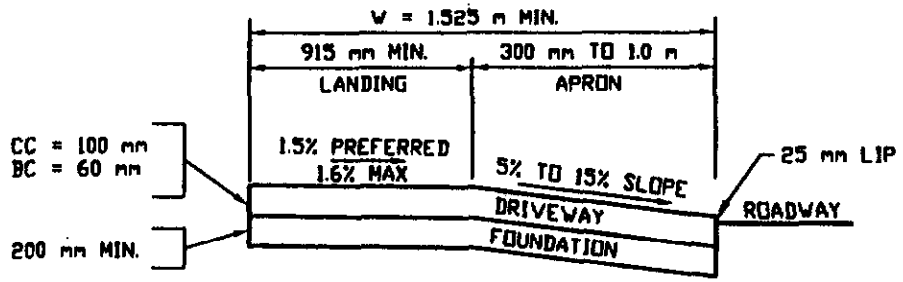
DRAWING NUMBER 107.7.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

DRIVEWAYS

1.525 m MIN. SIDEWALK
600 mm CURB CORNERS





SECTION B-B

DATE OF ISSUE
5/16/96

DRAWING NUMBER
107.8.0

MASSHIGHWAY CONSTRUCTION STANDARDS

CURB TRANSITION LENGTHS FOR WHEELCHAIR RAMPS

R = REVEAL IN mm
G = ROADWAY PROFILE GRADE (% OR DECIMAL: m/m)
TS = TRANSITION SLOPE (% OR DECIMAL: m/m)
HSL = HIGH SIDE TRANSITION LENGTH (METERS)

ROADWAY PROFILE GRADE		HIGH SIDE TRANSITION LENGTH		HIGH SIDE SLOPE FOR ROUNDED LENGTH (0.1 m)			
				7.5% DESIGN SLOPE		8.0% DESIGN SLOPE	
%	G	HSL METERS TS=0.075	HSL METERS TS=0.080	ROUNDED HIGH SIDE SLOPE LENGTH	ACTUAL SLOPE	ROUNDED HIGH SIDE SLOPE LENGTH	ACTUAL SLOPE
0	0.00	2.000	1.875	2.0	0.075	1.9	0.079
1	0.01	2.308	2.143	2.3	0.075	2.1	0.081
2	0.02	2.727	2.500	2.7	0.076	2.5	0.080
3	0.03	3.333	3.000	3.3	0.075	3.0	0.080
4	0.04	4.286	3.750	4.3	0.075	3.8	0.079
5	0.05	6.000	5.000	6.0	0.075	5.0	0.080

HSL = (R/1000)/(TS−G) ACTUAL SLOPE FOR ROUNDED LENGTH = (R/1000)/HSL+G
R = 150 mm

DATE OF ISSUE 5/16/96

DRAWING NUMBER 107.9.0

MINIMUM LANDING WIDTH = 1.22 m R (CURB REVEAL) = 150 mm					G = 0.0%							
					HIGH SIDE				LOW SIDE			
SIDEWALK WIDTH (METERS)	PERPENDICULAR RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES			
	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%
1.300	0.000	0.000	0.000	0.000	1.900	1.900	2.000	2.000	1.900	1.900	2.000	2.000
1.325	0.100	0.100	0.100	0.100	1.800	1.800	1.900	1.900	1.800	1.800	1.900	1.900
1.350	0.100	0.100	0.100	0.100	1.800	1.800	1.900	1.900	1.800	1.800	1.900	1.900
STATE MIN. 1.375	0.100	0.100	0.100	0.100	1.800	1.800	1.900	1.900	1.800	1.800	1.900	1.900
1.400	0.100	0.100	0.100	0.100	1.800	1.800	1.900	1.900	1.800	1.800	1.900	1.900
1.425	0.200	0.200	0.200	0.200	1.700	1.700	1.800	1.800	1.700	1.700	1.800	1.800
1.450	0.200	0.200	0.200	0.200	1.700	1.700	1.800	1.800	1.700	1.700	1.800	1.800
1.475	0.200	0.200	0.200	0.200	1.700	1.700	1.800	1.800	1.700	1.700	1.800	1.800
1.500	0.200	0.200	0.200	0.200	1.700	1.700	1.800	1.800	1.700	1.700	1.800	1.800
ADA MIN. 1.525	0.300	0.300	0.300	0.300	1.600	1.600	1.800	1.800	1.600	1.600	1.800	1.800
1.550	0.300	0.300	0.300	0.300	1.600	1.600	1.800	1.800	1.600	1.600	1.800	1.800
1.600	0.300	0.300	0.300	0.300	1.600	1.600	1.800	1.800	1.600	1.600	1.800	1.800
1.650	0.400	0.400	0.400	0.400	1.600	1.600	1.700	1.700	1.600	1.600	1.700	1.700
1.700	0.400	0.400	0.400	0.400	1.600	1.600	1.700	1.700	1.600	1.600	1.700	1.700
1.750	0.500	0.500	0.500	0.500	1.500	1.500	1.600	1.600	1.500	1.500	1.600	1.600
1.800	0.500	0.500	0.500	0.500	1.500	1.500	1.600	1.600	1.500	1.500	1.600	1.600
1.850	0.600	0.600	0.600	0.600	1.400	1.400	1.500	1.500	1.400	1.400	1.500	1.500
1.900	0.600	0.600	0.600	0.600	1.400	1.400	1.500	1.500	1.400	1.400	1.500	1.500
1.950	0.700	0.700	0.700	0.700	1.300	1.300	1.400	1.400	1.300	1.300	1.400	1.400
2.000	0.700	0.700	0.700	0.700	1.300	1.300	1.400	1.400	1.300	1.300	1.400	1.400
2.050	0.800	0.800	0.800	0.800	1.200	1.200	1.400	1.400	1.200	1.200	1.400	1.400
2.100	0.800	0.800	0.800	0.800	1.200	1.200	1.400	1.400	1.200	1.200	1.400	1.400
2.150	0.900	0.900	0.900	0.900	1.100	1.200	1.300	1.300	1.100	1.200	1.300	1.300
2.200	0.900	0.900	0.900	0.900	1.100	1.200	1.300	1.300	1.100	1.200	1.300	1.300
2.250	1.000	1.000	1.000	1.000	1.100	1.100	1.200	1.200	1.100	1.100	1.200	1.200
2.300	1.000	1.000	1.000	1.000	1.100	1.100	1.200	1.200	1.100	1.100	1.200	1.200
2.350	1.100	1.100	1.100	1.100	1.000	1.000	1.100	1.100	1.000	1.000	1.100	1.100
2.400	1.100	1.100	1.100	1.100	1.000	1.000	1.100	1.100	1.000	1.000	1.100	1.100
2.450	1.200	1.200	1.200	1.200	0.900	0.900	1.000	1.100	0.900	0.900	1.000	1.100
2.500	1.200	1.200	1.200	1.200	0.900	0.900	1.000	1.100	0.900	0.900	1.000	1.100
2.550	1.300	1.300	1.300	1.300	0.800	0.800	1.000	1.000	0.800	0.800	1.000	1.000
2.600	1.300	1.300	1.300	1.300	0.800	0.800	1.000	1.000	0.800	0.800	1.000	1.000
2.650	1.400	1.400	1.400	1.400	0.700	0.800	0.900	0.900	0.700	0.800	0.900	0.900
2.700	1.400	1.400	1.400	1.400	0.700	0.800	0.900	0.900	0.700	0.800	0.900	0.900
2.750	1.500	1.500	1.500	1.500	0.700	0.700	0.800	0.800	0.700	0.700	0.800	0.800
2.800	1.500	1.500	1.500	1.500	0.700	0.700	0.800	0.800	0.700	0.700	0.800	0.800
2.850	1.600	1.600	1.600	1.600	0.600	0.600	0.700	0.700	0.600	0.600	0.700	0.700
2.900	1.600	1.600	1.600	1.600	0.600	0.600	0.700	0.700	0.600	0.600	0.700	0.700
2.950	1.700	1.700	1.700	1.700	0.500	0.500	0.600	0.700	0.500	0.500	0.600	0.700
3.000	1.700	1.700	1.700	1.700	0.500	0.500	0.600	0.700	0.500	0.500	0.600	0.700
3.050	1.800	1.800	1.800	1.800	0.400	0.400	0.600	0.600	0.400	0.400	0.600	0.600
3.100	1.800	1.800	1.800	1.800	0.400	0.400	0.600	0.600	0.400	0.400	0.600	0.600
3.150	1.900	1.900	1.900	1.900	0.300	0.400	0.500	0.500	0.300	0.400	0.500	0.500
3.200	1.900	1.900	1.900	1.900	0.300	0.400	0.500	0.500	0.300	0.400	0.500	0.500
3.250	2.000	2.000	2.000	2.000	0.300	0.300	0.400	0.400	0.300	0.300	0.400	0.400
3.300	2.000	2.000	2.000	2.000	0.300	0.300	0.400	0.400	0.300	0.300	0.400	0.400
3.350	2.100	2.100	2.100	2.100	0.200	0.200	0.300	0.300	0.200	0.200	0.300	0.300
3.400	2.100	2.100	2.100	2.100	0.200	0.200	0.300	0.300	0.200	0.200	0.300	0.300
3.450	2.200	2.200	2.200	2.200	0.100	0.100	0.200	0.300	0.100	0.100	0.200	0.300
3.500	2.200	2.200	2.200	2.200	0.100	0.100	0.200	0.300	0.100	0.100	0.200	0.300
3.550	2.300	2.300	2.300	2.300	0.000	0.000	0.200	0.200	0.000	0.000	0.200	0.200
3.600	2.300	2.300	2.300	2.300	0.000	0.000	0.200	0.200	0.000	0.000	0.200	0.200
3.650	2.400	2.400	2.400	2.400	0.000	0.000	0.100	0.100	0.000	0.000	0.100	0.100
3.700	2.400	2.400	2.400	2.400	0.000	0.000	0.100	0.100	0.000	0.000	0.100	0.100
3.750	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.800	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.850	2.400	2.400	2.600	2.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

MASS HIGHWAY
CONSTRUCTION STANDARDS

RAMP LENGTH FOR SIDEWALK WIDTH AND PROFILE GRADE
0% GRADE

DATE OF ISSUE
5/16/96

DRAWING NUMBER
107.10.0

MINIMUM LANDING WIDTH = 1.22 m R (CURB REVEAL) = 150 mm					G = 1.0%							
					HIGH SIDE				LOW SIDE			
SIDEWALK WIDTH (METERS)	PERPENDICULAR RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES			
	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%
1.300	0.000	0.000	0.000	0.000	2.100	2.100	2.300	2.300	1.700	1.700	1.800	1.800
1.325	0.100	0.100	0.100	0.100	2.100	2.100	2.200	2.200	1.600	1.600	1.700	1.700
1.350	0.100	0.100	0.100	0.100	2.100	2.100	2.200	2.200	1.600	1.600	1.700	1.700
STATE MIN. 1.375	0.100	0.100	0.100	0.100	2.100	2.100	2.200	2.200	1.600	1.600	1.700	1.700
1.400	0.100	0.100	0.100	0.100	2.100	2.100	2.200	2.200	1.600	1.600	1.700	1.700
1.425	0.200	0.200	0.200	0.200	2.000	2.000	2.100	2.100	1.500	1.500	1.600	1.600
1.450	0.200	0.200	0.200	0.200	2.000	2.000	2.100	2.100	1.500	1.500	1.600	1.600
1.475	0.200	0.200	0.200	0.200	2.000	2.000	2.100	2.100	1.500	1.500	1.600	1.600
1.500	0.200	0.200	0.200	0.200	2.000	2.000	2.100	2.100	1.500	1.500	1.600	1.600
ADA MIN. 1.525	0.300	0.300	0.300	0.300	1.900	1.900	2.000	2.000	1.500	1.500	1.600	1.600
1.550	0.300	0.300	0.300	0.300	1.900	1.900	2.000	2.000	1.500	1.500	1.600	1.600
1.600	0.300	0.300	0.300	0.300	1.900	1.900	2.000	2.000	1.500	1.500	1.600	1.600
1.650	0.400	0.400	0.400	0.400	1.800	1.800	1.900	1.900	1.400	1.400	1.500	1.500
1.700	0.400	0.400	0.400	0.400	1.800	1.800	1.900	1.900	1.400	1.400	1.500	1.500
1.750	0.500	0.500	0.500	0.500	1.700	1.700	1.800	1.900	1.300	1.300	1.400	1.400
1.800	0.500	0.500	0.500	0.500	1.700	1.700	1.800	1.900	1.300	1.300	1.400	1.400
1.850	0.600	0.600	0.600	0.600	1.600	1.600	1.800	1.800	1.200	1.200	1.300	1.300
1.900	0.600	0.600	0.600	0.600	1.600	1.600	1.800	1.800	1.200	1.200	1.300	1.300
1.950	0.700	0.700	0.700	0.700	1.500	1.500	1.700	1.700	1.200	1.200	1.300	1.300
2.000	0.700	0.700	0.700	0.700	1.500	1.500	1.700	1.700	1.200	1.200	1.300	1.300
2.050	0.800	0.800	0.800	0.800	1.400	1.400	1.600	1.600	1.100	1.100	1.200	1.200
2.100	0.800	0.800	0.800	0.800	1.400	1.400	1.600	1.600	1.100	1.100	1.200	1.200
2.150	0.900	0.900	0.900	0.900	1.300	1.300	1.500	1.500	1.000	1.000	1.100	1.100
2.200	0.900	0.900	0.900	0.900	1.300	1.300	1.500	1.500	1.000	1.000	1.100	1.100
2.250	1.000	1.000	1.000	1.000	1.200	1.200	1.400	1.400	0.900	1.000	1.100	1.100
2.300	1.000	1.000	1.000	1.000	1.200	1.200	1.400	1.400	0.900	1.000	1.100	1.100
2.350	1.100	1.100	1.100	1.100	1.100	1.100	1.300	1.300	0.900	0.900	1.000	1.000
2.400	1.100	1.100	1.100	1.100	1.100	1.100	1.300	1.300	0.900	0.900	1.000	1.000
2.450	1.200	1.200	1.200	1.200	1.000	1.000	1.200	1.200	0.800	0.800	0.900	0.900
2.500	1.200	1.200	1.200	1.200	1.000	1.000	1.200	1.200	0.800	0.800	0.900	0.900
2.550	1.300	1.300	1.300	1.300	0.900	1.000	1.100	1.100	0.700	0.700	0.800	0.900
2.600	1.300	1.300	1.300	1.300	0.900	1.000	1.100	1.100	0.700	0.700	0.800	0.900
2.650	1.400	1.400	1.400	1.400	0.800	0.900	1.000	1.000	0.700	0.700	0.800	0.800
2.700	1.400	1.400	1.400	1.400	0.800	0.900	1.000	1.000	0.700	0.700	0.800	0.800
2.750	1.500	1.500	1.500	1.500	0.800	0.800	0.900	0.900	0.600	0.600	0.700	0.700
2.800	1.500	1.500	1.500	1.500	0.800	0.800	0.900	0.900	0.600	0.600	0.700	0.700
2.850	1.600	1.600	1.600	1.600	0.700	0.700	0.800	0.900	0.500	0.500	0.600	0.700
2.900	1.600	1.600	1.600	1.600	0.700	0.700	0.800	0.900	0.500	0.500	0.600	0.700
2.950	1.700	1.700	1.700	1.700	0.600	0.600	0.700	0.800	0.400	0.500	0.600	0.600
3.000	1.700	1.700	1.700	1.700	0.600	0.600	0.700	0.800	0.400	0.500	0.600	0.600
3.050	1.800	1.800	1.800	1.800	0.500	0.500	0.600	0.700	0.400	0.400	0.500	0.500
3.100	1.800	1.800	1.800	1.800	0.500	0.500	0.600	0.700	0.400	0.400	0.500	0.500
3.150	1.900	1.900	1.900	1.900	0.400	0.400	0.600	0.600	0.300	0.300	0.400	0.400
3.200	1.900	1.900	1.900	1.900	0.400	0.400	0.600	0.600	0.300	0.300	0.400	0.400
3.250	2.000	2.000	2.000	2.000	0.300	0.300	0.500	0.500	0.200	0.200	0.400	0.400
3.300	2.000	2.000	2.000	2.000	0.300	0.300	0.500	0.500	0.200	0.200	0.400	0.400
3.350	2.100	2.100	2.100	2.100	0.200	0.200	0.400	0.400	0.200	0.200	0.300	0.300
3.400	2.100	2.100	2.100	2.100	0.200	0.200	0.400	0.400	0.200	0.200	0.300	0.300
3.450	2.200	2.200	2.200	2.200	0.100	0.100	0.300	0.300	0.100	0.100	0.200	0.200
3.500	2.200	2.200	2.200	2.200	0.100	0.100	0.300	0.300	0.100	0.100	0.200	0.200
3.550	2.300	2.300	2.300	2.300	0.000	0.000	0.200	0.200	0.000	0.000	0.100	0.200
3.600	2.300	2.300	2.300	2.300	0.000	0.000	0.200	0.200	0.000	0.000	0.100	0.200
3.650	2.400	2.400	2.400	2.400	0.000	0.000	0.100	0.100	0.000	0.000	0.100	0.100
3.700	2.400	2.400	2.400	2.400	0.000	0.000	0.100	0.100	0.000	0.000	0.100	0.100
3.750	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.800	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.850	2.400	2.400	2.600	2.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

MASS HIGHWAY
CONSTRUCTION STANDARDS

RAMP LENGTH FOR SIDEWALK WIDTH AND PROFILE GRADE
1% GRADE

DATE OF ISSUE
5/16/96

DRAWING NUMBER
107.11.0

MINIMUM LANDING WIDTH = 1.22 m R (CURB REVEAL) = 150 mm					G = 2.0%							
					HIGH SIDE				LOW SIDE			
SIDEWALK WIDTH (METERS)	PERPENDICULAR RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES			
	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%
1.300	0.000	0.000	0.000	0.000	2.500	2.500	2.700	2.700	1.500	1.500	1.600	1.600
1.325	0.100	0.100	0.100	0.100	2.400	2.400	2.600	2.600	1.400	1.400	1.500	1.500
1.350	0.100	0.100	0.100	0.100	2.400	2.400	2.600	2.600	1.400	1.400	1.500	1.500
STATE MIN. 1.375	0.100	0.100	0.100	0.100	2.400	2.400	2.600	2.600	1.400	1.400	1.500	1.500
1.400	0.100	0.100	0.100	0.100	2.400	2.400	2.600	2.600	1.400	1.400	1.500	1.500
1.425	0.200	0.200	0.200	0.200	2.300	2.300	2.500	2.500	1.400	1.400	1.500	1.500
1.450	0.200	0.200	0.200	0.200	2.300	2.300	2.500	2.500	1.400	1.400	1.500	1.500
1.475	0.200	0.200	0.200	0.200	2.300	2.300	2.500	2.500	1.400	1.400	1.500	1.500
1.500	0.200	0.200	0.200	0.200	2.300	2.300	2.500	2.500	1.400	1.400	1.500	1.500
ADA MIN. 1.525	0.300	0.300	0.300	0.300	2.200	2.200	2.400	2.400	1.300	1.300	1.400	1.400
1.550	0.300	0.300	0.300	0.300	2.200	2.200	2.400	2.400	1.300	1.300	1.400	1.400
1.600	0.300	0.300	0.300	0.300	2.200	2.200	2.400	2.400	1.300	1.300	1.400	1.400
1.650	0.400	0.400	0.400	0.400	2.100	2.100	2.300	2.300	1.200	1.200	1.300	1.300
1.700	0.400	0.400	0.400	0.400	2.100	2.100	2.300	2.300	1.200	1.200	1.300	1.300
1.750	0.500	0.500	0.500	0.500	2.000	2.000	2.200	2.200	1.200	1.200	1.300	1.300
1.800	0.500	0.500	0.500	0.500	2.000	2.000	2.200	2.200	1.200	1.200	1.300	1.300
1.850	0.600	0.600	0.600	0.600	1.900	1.900	2.100	2.100	1.100	1.100	1.200	1.200
1.900	0.600	0.600	0.600	0.600	1.900	1.900	2.100	2.100	1.100	1.100	1.200	1.200
1.950	0.700	0.700	0.700	0.700	1.700	1.800	2.000	2.000	1.000	1.100	1.100	1.100
2.000	0.700	0.700	0.700	0.700	1.700	1.800	2.000	2.000	1.000	1.100	1.100	1.100
2.050	0.800	0.800	0.800	0.800	1.600	1.600	1.900	1.900	1.000	1.000	1.100	1.100
2.100	0.800	0.800	0.800	0.800	1.600	1.600	1.900	1.900	1.000	1.000	1.100	1.100
2.150	0.900	0.900	0.900	0.900	1.500	1.500	1.700	1.800	0.900	0.900	1.000	1.000
2.200	0.900	0.900	0.900	0.900	1.500	1.500	1.700	1.800	0.900	0.900	1.000	1.000
2.250	1.000	1.000	1.000	1.000	1.400	1.400	1.600	1.700	0.900	0.900	0.900	1.000
2.300	1.000	1.000	1.000	1.000	1.400	1.400	1.600	1.700	0.900	0.900	0.900	1.000
2.350	1.100	1.100	1.100	1.100	1.300	1.300	1.500	1.500	0.800	0.800	0.900	0.900
2.400	1.100	1.100	1.100	1.100	1.300	1.300	1.500	1.500	0.800	0.800	0.900	0.900
2.450	1.200	1.200	1.200	1.200	1.200	1.200	1.400	1.400	0.700	0.700	0.800	0.800
2.500	1.200	1.200	1.200	1.200	1.200	1.200	1.400	1.400	0.700	0.700	0.800	0.800
2.550	1.300	1.300	1.300	1.300	1.100	1.100	1.300	1.300	0.700	0.700	0.800	0.800
2.600	1.300	1.300	1.300	1.300	1.100	1.100	1.300	1.300	0.700	0.700	0.800	0.800
2.650	1.400	1.400	1.400	1.400	1.000	1.000	1.200	1.200	0.600	0.600	0.700	0.700
2.700	1.400	1.400	1.400	1.400	1.000	1.000	1.200	1.200	0.600	0.600	0.700	0.700
2.750	1.500	1.500	1.500	1.500	0.900	0.900	1.100	1.100	0.500	0.500	0.600	0.600
2.800	1.500	1.500	1.500	1.500	0.900	0.900	1.100	1.100	0.500	0.500	0.600	0.600
2.850	1.600	1.600	1.600	1.600	0.800	0.800	1.000	1.000	0.500	0.500	0.600	0.600
2.900	1.600	1.600	1.600	1.600	0.800	0.800	1.000	1.000	0.500	0.500	0.600	0.600
2.950	1.700	1.700	1.700	1.700	0.700	0.700	0.900	0.900	0.400	0.400	0.500	0.500
3.000	1.700	1.700	1.700	1.700	0.700	0.700	0.900	0.900	0.400	0.400	0.500	0.500
3.050	1.800	1.800	1.800	1.800	0.600	0.600	0.800	0.800	0.300	0.300	0.400	0.500
3.100	1.800	1.800	1.800	1.800	0.600	0.600	0.800	0.800	0.300	0.300	0.400	0.500
3.150	1.900	1.900	1.900	1.900	0.400	0.500	0.700	0.700	0.300	0.300	0.400	0.400
3.200	1.900	1.900	1.900	1.900	0.400	0.500	0.700	0.700	0.300	0.300	0.400	0.400
3.250	2.000	2.000	2.000	2.000	0.300	0.400	0.500	0.600	0.200	0.200	0.300	0.300
3.300	2.000	2.000	2.000	2.000	0.300	0.400	0.500	0.600	0.200	0.200	0.300	0.300
3.350	2.100	2.100	2.100	2.100	0.200	0.300	0.400	0.500	0.100	0.200	0.300	0.300
3.400	2.100	2.100	2.100	2.100	0.200	0.300	0.400	0.500	0.100	0.200	0.300	0.300
3.450	2.200	2.200	2.200	2.200	0.100	0.200	0.300	0.400	0.100	0.100	0.200	0.200
3.500	2.200	2.200	2.200	2.200	0.100	0.200	0.300	0.400	0.100	0.100	0.200	0.200
3.550	2.300	2.300	2.300	2.300	0.000	0.000	0.200	0.300	0.000	0.000	0.100	0.200
3.600	2.300	2.300	2.300	2.300	0.000	0.000	0.200	0.300	0.000	0.000	0.100	0.200
3.650	2.400	2.400	2.400	2.400	0.000	0.000	0.100	0.200	0.000	0.000	0.100	0.100
3.700	2.400	2.400	2.400	2.400	0.000	0.000	0.100	0.200	0.000	0.000	0.100	0.100
3.750	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.800	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.850	2.400	2.400	2.600	2.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

MASS HIGHWAY CONSTRUCTION STANDARDS

RAMP LENGTH FOR SIDEWALK WIDTH AND PROFILE GRADE

2% GRADE

DATE OF ISSUE
5/16/96

DRAWING NUMBER
107.12.0

MINIMUM LANDING WIDTH = 1.22 m R (CURB REVEAL) = 150 mm					G = 3.0%							
					HIGH SIDE				LOW SIDE			
SIDEWALK WIDTH (METERS)	PERPENDICULAR RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES			
	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%
1.300	0.000	0.000	0.000	0.000	3.000	3.000	3.300	3.300	1.400	1.400	1.400	1.400
1.325	0.100	0.100	0.100	0.100	2.900	2.900	3.200	3.200	1.300	1.300	1.400	1.400
1.350	0.100	0.100	0.100	0.100	2.900	2.900	3.200	3.200	1.300	1.300	1.400	1.400
STATE MIN. 1.375	0.100	0.100	0.100	0.100	2.900	2.900	3.200	3.200	1.300	1.300	1.400	1.400
1.400	0.100	0.100	0.100	0.100	2.900	2.900	3.200	3.200	1.300	1.300	1.400	1.400
1.425	0.200	0.200	0.200	0.200	2.700	2.700	3.100	3.100	1.200	1.200	1.300	1.300
1.450	0.200	0.200	0.200	0.200	2.700	2.700	3.100	3.100	1.200	1.200	1.300	1.300
1.475	0.200	0.200	0.200	0.200	2.700	2.700	3.100	3.100	1.200	1.200	1.300	1.300
1.500	0.200	0.200	0.200	0.200	2.700	2.700	3.100	3.100	1.200	1.200	1.300	1.300
ADA MIN. 1.525	0.300	0.300	0.300	0.300	2.600	2.600	2.900	2.900	1.200	1.200	1.300	1.300
1.550	0.300	0.300	0.300	0.300	2.600	2.600	2.900	2.900	1.200	1.200	1.300	1.300
1.600	0.300	0.300	0.300	0.300	2.600	2.600	2.900	2.900	1.200	1.200	1.300	1.300
1.650	0.400	0.400	0.400	0.400	2.500	2.500	2.800	2.800	1.100	1.100	1.200	1.200
1.700	0.400	0.400	0.400	0.400	2.500	2.500	2.800	2.800	1.100	1.100	1.200	1.200
1.750	0.500	0.500	0.500	0.500	2.400	2.400	2.700	2.700	1.100	1.100	1.100	1.100
1.800	0.500	0.500	0.500	0.500	2.400	2.400	2.700	2.700	1.100	1.100	1.100	1.100
1.850	0.600	0.600	0.600	0.600	2.200	2.200	2.500	2.500	1.000	1.000	1.100	1.100
1.900	0.600	0.600	0.600	0.600	2.200	2.200	2.500	2.500	1.000	1.000	1.100	1.100
1.950	0.700	0.700	0.700	0.700	2.100	2.100	2.400	2.400	1.000	1.000	1.000	1.000
2.000	0.700	0.700	0.700	0.700	2.100	2.100	2.400	2.400	1.000	1.000	1.000	1.000
2.050	0.800	0.800	0.800	0.800	2.000	2.000	2.300	2.300	0.900	0.900	1.000	1.000
2.100	0.800	0.800	0.800	0.800	2.000	2.000	2.300	2.300	0.900	0.900	1.000	1.000
2.150	0.900	0.900	0.900	0.900	1.800	1.800	2.100	2.200	0.800	0.800	0.900	0.900
2.200	0.900	0.900	0.900	0.900	1.800	1.800	2.100	2.200	0.800	0.800	0.900	0.900
2.250	1.000	1.000	1.000	1.000	1.700	1.700	2.000	2.000	0.800	0.800	0.900	0.900
2.300	1.000	1.000	1.000	1.000	1.700	1.700	2.000	2.000	0.800	0.800	0.900	0.900
2.350	1.100	1.100	1.100	1.100	1.600	1.600	1.900	1.900	0.700	0.700	0.800	0.800
2.400	1.100	1.100	1.100	1.100	1.600	1.600	1.900	1.900	0.700	0.700	0.800	0.800
2.450	1.200	1.200	1.200	1.200	1.400	1.500	1.700	1.800	0.700	0.700	0.700	0.800
2.500	1.200	1.200	1.200	1.200	1.400	1.500	1.700	1.800	0.700	0.700	0.700	0.800
2.550	1.300	1.300	1.300	1.300	1.300	1.300	1.600	1.600	0.600	0.600	0.700	0.700
2.600	1.300	1.300	1.300	1.300	1.300	1.300	1.600	1.600	0.600	0.600	0.700	0.700
2.650	1.400	1.400	1.400	1.400	1.200	1.200	1.500	1.500	0.500	0.500	0.600	0.600
2.700	1.400	1.400	1.400	1.400	1.200	1.200	1.500	1.500	0.500	0.500	0.600	0.600
2.750	1.500	1.500	1.500	1.500	1.100	1.100	1.300	1.400	0.500	0.500	0.600	0.600
2.800	1.500	1.500	1.500	1.500	1.100	1.100	1.300	1.400	0.500	0.500	0.600	0.600
2.850	1.600	1.600	1.600	1.600	0.900	1.000	1.200	1.200	0.400	0.400	0.500	0.500
2.900	1.600	1.600	1.600	1.600	0.900	1.000	1.200	1.200	0.400	0.400	0.500	0.500
2.950	1.700	1.700	1.700	1.700	0.800	0.800	1.100	1.100	0.400	0.400	0.500	0.500
3.000	1.700	1.700	1.700	1.700	0.800	0.800	1.100	1.100	0.400	0.400	0.500	0.500
3.050	1.800	1.800	1.800	1.800	0.700	0.700	0.900	1.000	0.300	0.300	0.400	0.400
3.100	1.800	1.800	1.800	1.800	0.700	0.700	0.900	1.000	0.300	0.300	0.400	0.400
3.150	1.900	1.900	1.900	1.900	0.500	0.600	0.800	0.800	0.200	0.300	0.300	0.400
3.200	1.900	1.900	1.900	1.900	0.500	0.600	0.800	0.800	0.200	0.300	0.300	0.400
3.250	2.000	2.000	2.000	2.000	0.400	0.400	0.700	0.700	0.200	0.200	0.300	0.300
3.300	2.000	2.000	2.000	2.000	0.400	0.400	0.700	0.700	0.200	0.200	0.300	0.300
3.350	2.100	2.100	2.100	2.100	0.300	0.300	0.500	0.600	0.100	0.100	0.200	0.200
3.400	2.100	2.100	2.100	2.100	0.300	0.300	0.500	0.600	0.100	0.100	0.200	0.200
3.450	2.200	2.200	2.200	2.200	0.100	0.200	0.400	0.400	0.100	0.100	0.200	0.200
3.500	2.200	2.200	2.200	2.200	0.100	0.200	0.400	0.400	0.100	0.100	0.200	0.200
3.550	2.300	2.300	2.300	2.300	0.000	0.100	0.300	0.300	0.000	0.000	0.100	0.100
3.600	2.300	2.300	2.300	2.300	0.000	0.100	0.300	0.300	0.000	0.000	0.100	0.100
3.650	2.400	2.400	2.400	2.400	0.000	0.000	0.100	0.200	0.000	0.000	0.100	0.100
3.700	2.400	2.400	2.400	2.400	0.000	0.000	0.100	0.200	0.000	0.000	0.100	0.100
3.750	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.800	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.850	2.400	2.400	2.600	2.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

MASS HIGHWAY CONSTRUCTION STANDARDS

RAMP LENGTH FOR SIDEWALK WIDTH AND PROFILE GRADE

3% GRADE

DATE OF ISSUE
5/16/96

DRAWING NUMBER
107.13.0

MINIMUM LANDING WIDTH = 1.22 m R (CURB REVEAL) = 150 mm					G = 4.0%							
					HIGH SIDE				LOW SIDE			
SIDEWALK WIDTH (METERS)	PERPENDICULAR RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES			
	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%
1.300	0.000	0.000	0.000	0.000	3.800	3.800	4.300	4.300	1.300	1.300	1.300	1.300
1.325	0.100	0.100	0.100	0.100	3.600	3.600	4.100	4.100	1.200	1.200	1.300	1.300
1.350	0.100	0.100	0.100	0.100	3.600	3.600	4.100	4.100	1.200	1.200	1.300	1.300
STATE MIN. 1.375	0.100	0.100	0.100	0.100	3.600	3.600	4.100	4.100	1.200	1.200	1.300	1.300
1.400	0.100	0.100	0.100	0.100	3.600	3.600	4.100	4.100	1.200	1.200	1.300	1.300
1.425	0.200	0.200	0.200	0.200	3.400	3.400	3.900	3.900	1.100	1.100	1.200	1.200
1.450	0.200	0.200	0.200	0.200	3.400	3.400	3.900	3.900	1.100	1.100	1.200	1.200
1.475	0.200	0.200	0.200	0.200	3.400	3.400	3.900	3.900	1.100	1.100	1.200	1.200
1.500	0.200	0.200	0.200	0.200	3.400	3.400	3.900	3.900	1.100	1.100	1.200	1.200
ADA MIN. 1.525	0.300	0.300	0.300	0.300	3.300	3.300	3.800	3.800	1.100	1.100	1.100	1.200
1.550	0.300	0.300	0.300	0.300	3.300	3.300	3.800	3.800	1.100	1.100	1.100	1.200
1.600	0.300	0.300	0.300	0.300	3.300	3.300	3.800	3.800	1.100	1.100	1.100	1.200
1.650	0.400	0.400	0.400	0.400	3.100	3.100	3.600	3.600	1.000	1.000	1.100	1.100
1.700	0.400	0.400	0.400	0.400	3.100	3.100	3.600	3.600	1.000	1.000	1.100	1.100
1.750	0.500	0.500	0.500	0.500	2.900	3.000	3.400	3.400	1.000	1.000	1.000	1.000
1.800	0.500	0.500	0.500	0.500	2.900	3.000	3.400	3.400	1.000	1.000	1.000	1.000
1.850	0.600	0.600	0.600	0.600	2.800	2.800	3.300	3.300	0.900	0.900	1.000	1.000
1.900	0.600	0.600	0.600	0.600	2.800	2.800	3.300	3.300	0.900	0.900	1.000	1.000
1.950	0.700	0.700	0.700	0.700	2.600	2.600	3.100	3.100	0.900	0.900	0.900	0.900
2.000	0.700	0.700	0.700	0.700	2.600	2.600	3.100	3.100	0.900	0.900	0.900	0.900
2.050	0.800	0.800	0.800	0.800	2.500	2.500	2.900	2.900	0.800	0.800	0.900	0.900
2.100	0.800	0.800	0.800	0.800	2.500	2.500	2.900	2.900	0.800	0.800	0.900	0.900
2.150	0.900	0.900	0.900	0.900	2.300	2.300	2.700	2.800	0.800	0.800	0.800	0.800
2.200	0.900	0.900	0.900	0.900	2.300	2.300	2.700	2.800	0.800	0.800	0.800	0.800
2.250	1.000	1.000	1.000	1.000	2.100	2.200	2.600	2.600	0.700	0.700	0.800	0.800
2.300	1.000	1.000	1.000	1.000	2.100	2.200	2.600	2.600	0.700	0.700	0.800	0.800
2.350	1.100	1.100	1.100	1.100	2.000	2.000	2.400	2.400	0.700	0.700	0.700	0.700
2.400	1.100	1.100	1.100	1.100	2.000	2.000	2.400	2.400	0.700	0.700	0.700	0.700
2.450	1.200	1.200	1.200	1.200	1.800	1.800	2.200	2.300	0.600	0.600	0.700	0.700
2.500	1.200	1.200	1.200	1.200	1.800	1.800	2.200	2.300	0.600	0.600	0.700	0.700
2.550	1.300	1.300	1.300	1.300	1.600	1.700	2.100	2.100	0.500	0.600	0.600	0.600
2.600	1.300	1.300	1.300	1.300	1.600	1.700	2.100	2.100	0.500	0.600	0.600	0.600
2.650	1.400	1.400	1.400	1.400	1.500	1.500	1.900	1.900	0.500	0.500	0.600	0.600
2.700	1.400	1.400	1.400	1.400	1.500	1.500	1.900	1.900	0.500	0.500	0.600	0.600
2.750	1.500	1.500	1.500	1.500	1.300	1.400	1.700	1.800	0.400	0.500	0.500	0.500
2.800	1.500	1.500	1.500	1.500	1.300	1.400	1.700	1.800	0.400	0.500	0.500	0.500
2.850	1.600	1.600	1.600	1.600	1.200	1.200	1.500	1.600	0.400	0.400	0.500	0.500
2.900	1.600	1.600	1.600	1.600	1.200	1.200	1.500	1.600	0.400	0.400	0.500	0.500
2.950	1.700	1.700	1.700	1.700	1.000	1.000	1.400	1.400	0.300	0.300	0.400	0.400
3.000	1.700	1.700	1.700	1.700	1.000	1.000	1.400	1.400	0.300	0.300	0.400	0.400
3.050	1.800	1.800	1.800	1.800	0.800	0.900	1.200	1.300	0.300	0.300	0.400	0.400
3.100	1.800	1.800	1.800	1.800	0.800	0.900	1.200	1.300	0.300	0.300	0.400	0.400
3.150	1.900	1.900	1.900	1.900	0.700	0.700	1.000	1.100	0.200	0.200	0.300	0.300
3.200	1.900	1.900	1.900	1.900	0.700	0.700	1.000	1.100	0.200	0.200	0.300	0.300
3.250	2.000	2.000	2.000	2.000	0.500	0.600	0.900	0.900	0.200	0.200	0.300	0.300
3.300	2.000	2.000	2.000	2.000	0.500	0.600	0.900	0.900	0.200	0.200	0.300	0.300
3.350	2.100	2.100	2.100	2.100	0.300	0.400	0.700	0.700	0.100	0.100	0.200	0.200
3.400	2.100	2.100	2.100	2.100	0.300	0.400	0.700	0.700	0.100	0.100	0.200	0.200
3.450	2.200	2.200	2.200	2.200	0.200	0.200	0.500	0.600	0.100	0.100	0.200	0.200
3.500	2.200	2.200	2.200	2.200	0.200	0.200	0.500	0.600	0.100	0.100	0.200	0.200
3.550	2.300	2.300	2.300	2.300	0.000	0.100	0.300	0.400	0.000	0.000	0.100	0.100
3.600	2.300	2.300	2.300	2.300	0.000	0.100	0.300	0.400	0.000	0.000	0.100	0.100
3.650	2.400	2.400	2.400	2.400	0.000	0.000	0.200	0.200	0.000	0.000	0.100	0.100
3.700	2.400	2.400	2.400	2.400	0.000	0.000	0.200	0.200	0.000	0.000	0.100	0.100
3.750	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.800	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.850	2.400	2.400	2.600	2.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

MASS HIGHWAY
CONSTRUCTION STANDARDS

RAMP LENGTH FOR SIDEWALK WIDTH AND PROFILE GRADE
4% GRADE

DATE OF ISSUE
5/16/96

DRAWING NUMBER
107.14.0

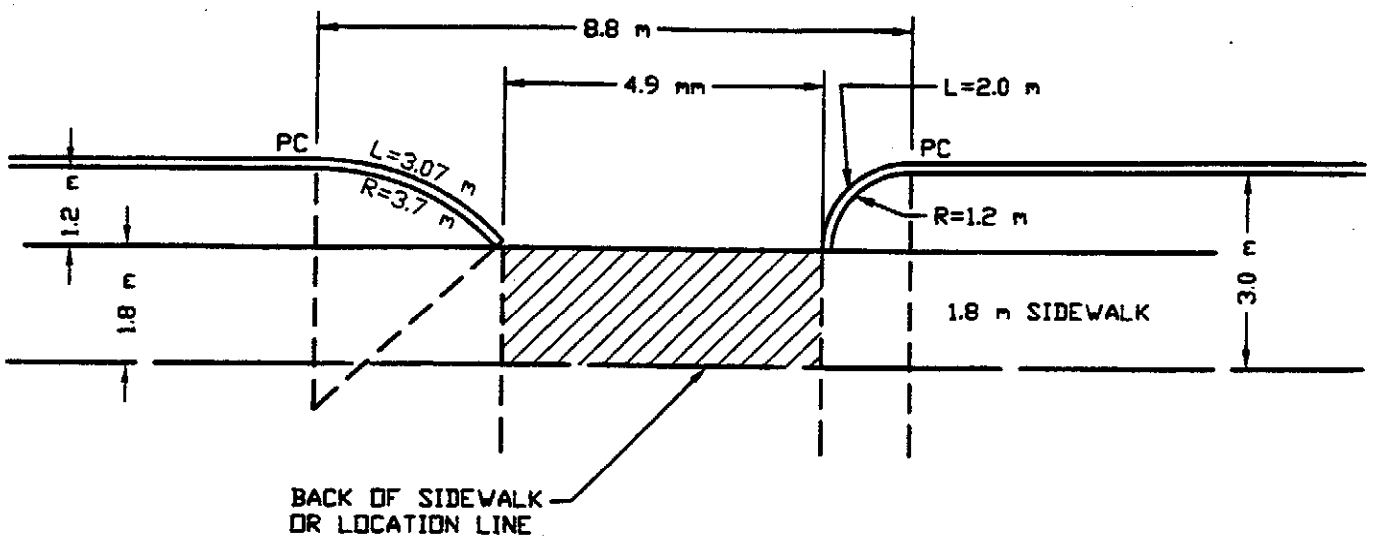
MINIMUM LANDING WIDTH = 1.22 m R (CURB REVEAL) = 150 mm					G = 5.0%							
					HIGH SIDE				LOW SIDE			
SIDEWALK WIDTH (METERS)	PERPENDICULAR RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES				PARALLEL RAMP LENGTH @8.00% @7.50% SIDEWALK CROSS SLOPES			
	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%	1.50%	1.60%
1.300	0.000	0.000	0.000	0.000	5.000	5.000	6.000	6.000	1.200	1.200	1.200	1.200
1.325	0.100	0.100	0.100	0.100	4.800	4.800	5.800	5.800	1.100	1.100	1.200	1.200
1.350	0.100	0.100	0.100	0.100	4.800	4.800	5.800	5.800	1.100	1.100	1.200	1.200
STATE MIN. 1.375	0.100	0.100	0.100	0.100	4.800	4.800	5.800	5.800	1.100	1.100	1.200	1.200
1.400	0.100	0.100	0.100	0.100	4.800	4.800	5.800	5.800	1.100	1.100	1.200	1.200
1.425	0.200	0.200	0.200	0.200	4.600	4.600	5.500	5.500	1.100	1.100	1.100	1.100
1.450	0.200	0.200	0.200	0.200	4.600	4.600	5.500	5.500	1.100	1.100	1.100	1.100
1.475	0.200	0.200	0.200	0.200	4.600	4.600	5.500	5.500	1.100	1.100	1.100	1.100
1.500	0.200	0.200	0.200	0.200	4.600	4.600	5.500	5.500	1.100	1.100	1.100	1.100
ADA MIN. 1.525	0.300	0.300	0.300	0.300	4.400	4.400	5.300	5.300	1.000	1.000	1.100	1.100
1.550	0.300	0.300	0.300	0.300	4.400	4.400	5.300	5.300	1.000	1.000	1.100	1.100
1.600	0.300	0.300	0.300	0.300	4.400	4.400	5.300	5.300	1.000	1.000	1.100	1.100
1.650	0.400	0.400	0.400	0.400	4.100	4.100	5.000	5.100	1.000	1.000	1.000	1.000
1.700	0.400	0.400	0.400	0.400	4.100	4.100	5.000	5.100	1.000	1.000	1.000	1.000
1.750	0.500	0.500	0.500	0.500	3.900	3.900	4.800	4.800	0.900	0.900	1.000	1.000
1.800	0.500	0.500	0.500	0.500	3.900	3.900	4.800	4.800	0.900	0.900	1.000	1.000
1.850	0.600	0.600	0.600	0.600	3.700	3.700	4.600	4.600	0.900	0.900	0.900	0.900
1.900	0.600	0.600	0.600	0.600	3.700	3.700	4.600	4.600	0.900	0.900	0.900	0.900
1.950	0.700	0.700	0.700	0.700	3.500	3.500	4.300	4.300	0.800	0.800	0.900	0.900
2.000	0.700	0.700	0.700	0.700	3.500	3.500	4.300	4.300	0.800	0.800	0.900	0.900
2.050	0.800	0.800	0.800	0.800	3.300	3.300	4.100	4.100	0.800	0.800	0.800	0.800
2.100	0.800	0.800	0.800	0.800	3.300	3.300	4.100	4.100	0.800	0.800	0.800	0.800
2.150	0.900	0.900	0.900	0.900	3.100	3.100	3.800	3.900	0.700	0.700	0.800	0.800
2.200	0.900	0.900	0.900	0.900	3.100	3.100	3.800	3.900	0.700	0.700	0.800	0.800
2.250	1.000	1.000	1.000	1.000	2.800	2.900	3.600	3.600	0.700	0.700	0.700	0.700
2.300	1.000	1.000	1.000	1.000	2.800	2.900	3.600	3.600	0.700	0.700	0.700	0.700
2.350	1.100	1.100	1.100	1.100	2.600	2.700	3.400	3.400	0.600	0.600	0.700	0.700
2.400	1.100	1.100	1.100	1.100	2.600	2.700	3.400	3.400	0.600	0.600	0.700	0.700
2.450	1.200	1.200	1.200	1.200	2.400	2.400	3.100	3.200	0.600	0.600	0.600	0.600
2.500	1.200	1.200	1.200	1.200	2.400	2.400	3.100	3.200	0.600	0.600	0.600	0.600
2.550	1.300	1.300	1.300	1.300	2.200	2.200	2.900	2.900	0.500	0.500	0.600	0.600
2.600	1.300	1.300	1.300	1.300	2.200	2.200	2.900	2.900	0.500	0.500	0.600	0.600
2.650	1.400	1.400	1.400	1.400	2.000	2.000	2.600	2.700	0.500	0.500	0.500	0.500
2.700	1.400	1.400	1.400	1.400	2.000	2.000	2.600	2.700	0.500	0.500	0.500	0.500
2.750	1.500	1.500	1.500	1.500	1.800	1.800	2.400	2.500	0.400	0.400	0.500	0.500
2.800	1.500	1.500	1.500	1.500	1.800	1.800	2.400	2.500	0.400	0.400	0.500	0.500
2.850	1.600	1.600	1.600	1.600	1.500	1.600	2.200	2.200	0.400	0.400	0.400	0.400
2.900	1.600	1.600	1.600	1.600	1.500	1.600	2.200	2.200	0.400	0.400	0.400	0.400
2.950	1.700	1.700	1.700	1.700	1.300	1.400	1.900	2.000	0.300	0.300	0.400	0.400
3.000	1.700	1.700	1.700	1.700	1.300	1.400	1.900	2.000	0.300	0.300	0.400	0.400
3.050	1.800	1.800	1.800	1.800	1.100	1.200	1.700	1.800	0.300	0.300	0.300	0.400
3.100	1.800	1.800	1.800	1.800	1.100	1.200	1.700	1.800	0.300	0.300	0.300	0.400
3.150	1.900	1.900	1.900	1.900	0.900	0.900	1.400	1.500	0.200	0.200	0.300	0.300
3.200	1.900	1.900	1.900	1.900	0.900	0.900	1.400	1.500	0.200	0.200	0.300	0.300
3.250	2.000	2.000	2.000	2.000	0.700	0.700	1.200	1.300	0.200	0.200	0.200	0.300
3.300	2.000	2.000	2.000	2.000	0.700	0.700	1.200	1.300	0.200	0.200	0.200	0.300
3.350	2.100	2.100	2.100	2.100	0.400	0.500	1.000	1.000	0.100	0.100	0.200	0.200
3.400	2.100	2.100	2.100	2.100	0.400	0.500	1.000	1.000	0.100	0.100	0.200	0.200
3.450	2.200	2.200	2.200	2.200	0.200	0.300	0.700	0.800	0.100	0.100	0.100	0.200
3.500	2.200	2.200	2.200	2.200	0.200	0.300	0.700	0.800	0.100	0.100	0.100	0.200
3.550	2.300	2.300	2.300	2.300	0.000	0.100	0.500	0.600	0.000	0.000	0.100	0.100
3.600	2.300	2.300	2.300	2.300	0.000	0.100	0.500	0.600	0.000	0.000	0.100	0.100
3.650	2.400	2.400	2.400	2.400	0.000	0.000	0.200	0.300	0.000	0.000	0.000	0.100
3.700	2.400	2.400	2.400	2.400	0.000	0.000	0.200	0.300	0.000	0.000	0.000	0.100
3.750	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.800	2.400	2.400	2.500	2.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
3.850	2.400	2.400	2.600	2.600	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

MASS HIGHWAY
CONSTRUCTION STANDARDS

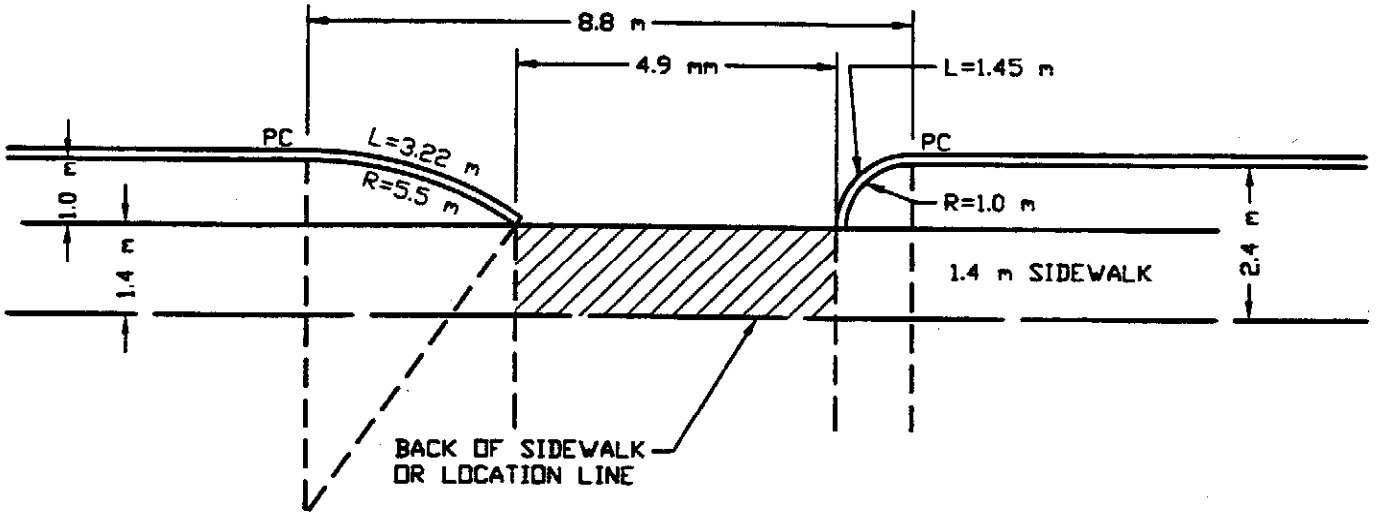
RAMP LENGTH FOR SIDEWALK WIDTH AND PROFILE GRADE
5% GRADE

DATE OF ISSUE
5/16/96

DRAWING NUMBER
107.15.0



3.0 m SIDEWALK LAYOUT



2.4 m SIDEWALK LAYOUT

NOTES:

1. WHEN THE SIDEWALK IS PAVED TO THE CURB LINE, USE SHORT CURB RETURNS AT THE HIGHWAY CURB LINE PC'S, SHOWN IN THESE DESIGNS.

MUST MAINTAIN 1.0 m LEVEL PATH OF TRAVEL ALONG BACK OF SIDEWALK.

MASS HIGHWAY CONSTRUCTION STANDARDS

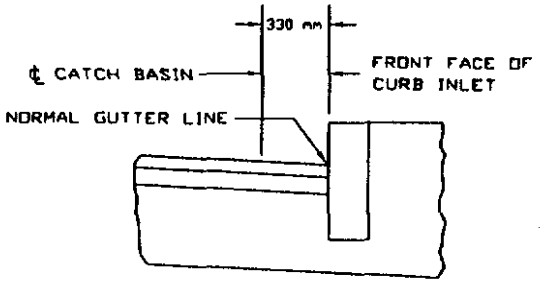
STANDARD DRIVES RESIDENTIAL

DATE OF ISSUE 5/16/96

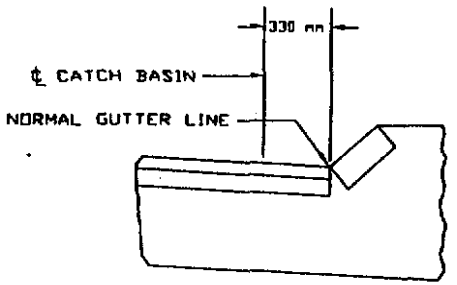
DRAWING NUMBER 107.8.1

MASS HIGHWAY
CONSTRUCTION STANDARDS

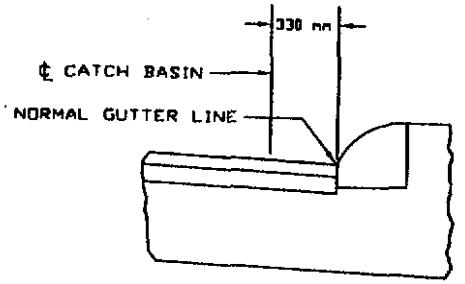
LOCATION OF CATCH BASINS



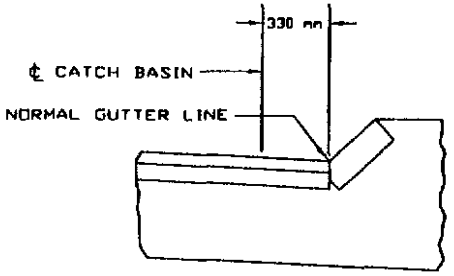
VERTICAL CURB



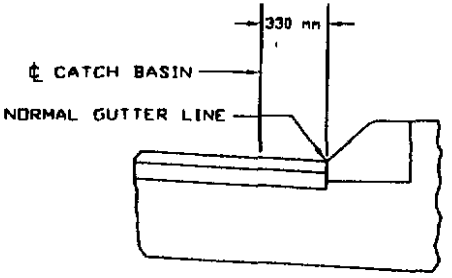
GRAN. SLOPED EDGING



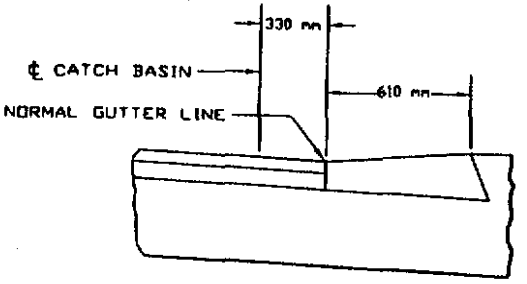
GRAN. FACED PRECAST CONC. EDGING TYPE-A



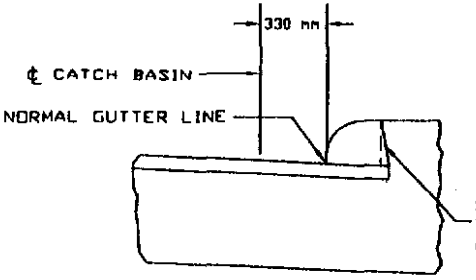
GRAN. FACED PRECAST CONC. EDGING TYPE-B



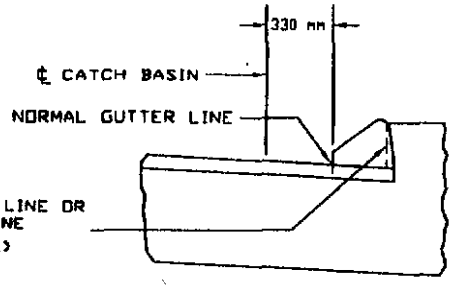
GRAN. FACED PRECAST CONC. EDGING TYPE-C



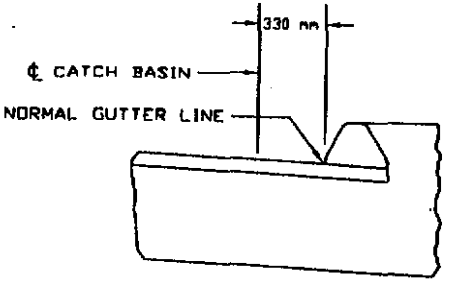
BIT. CONC. BERM TYPE-A



BIT. CONC. CURB TYPE-1



BIT. CONC. CURB TYPE-2



BIT. CONC. CURB TYPE-3

DRAWING NUMBER
201.1.0

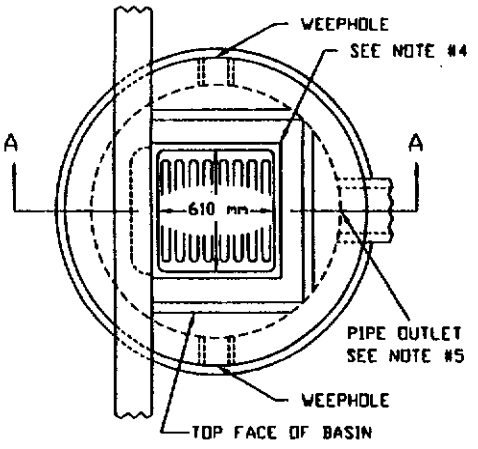
DATE OF ISSUE
9/22/95

MASS HIGHWAY
CONSTRUCTION STANDARDS

CONCRETE BLOCK CATCH BASIN

DATE OF ISSUE 9/22/95

DRAWING NUMBER 201.3.0

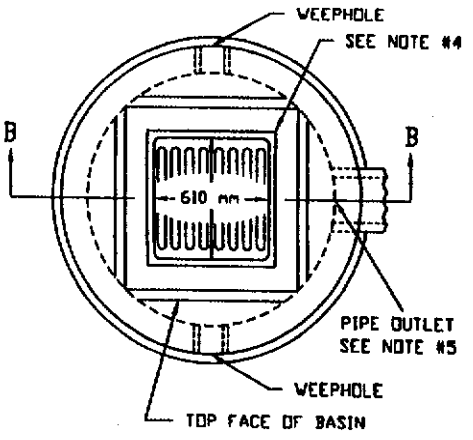


BASIN WITH CURB INLET

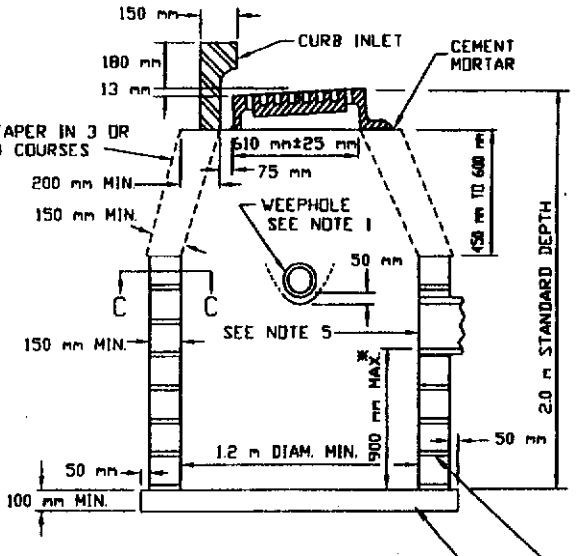
* MINIMUM DEPTH OF SUMP TO BE 600 mm

NOTES:

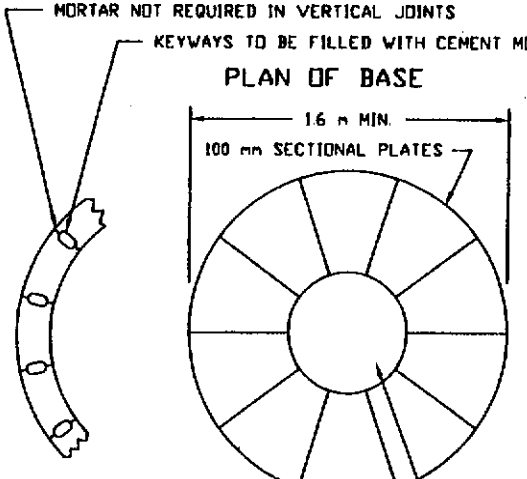
1. WEEPHOLES SHALL BE 100 mm PIPE OPENING OR EQUIVALENT WITH 6 mm MESH, 0.6 mm GALVANIZED WIRE SCREEN COVERING. 0.06 CUBIC METERS OF CRUSHED STONE SHALL BE PLACED AROUND EACH WEEPHOLE.
2. BRICKS MAY BE USED BETWEEN TOP COURSE AND C.B. FRAME FOR GRADE ADJUSTMENT. FRAME SHALL BE SET IN FULL BED OF MORTAR.
3. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.
4. DETAILS SHOWN ON DRAWINGS 201.6.0 - 201.11.0
5. FACE OF PIPE FLUSH OR NOT TO PROJECT MORE THAN 100 mm FROM FACE OF WALL ALONG CENTERLINE OF PIPE.



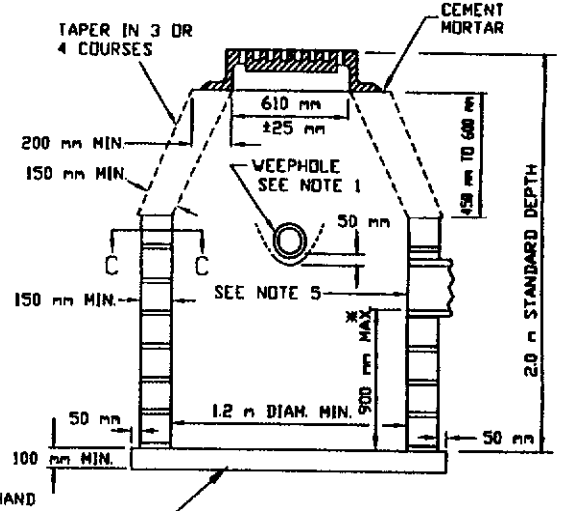
BASIN WITH 4 FLANGE INLET



SECTION A-A



SECTION C-C

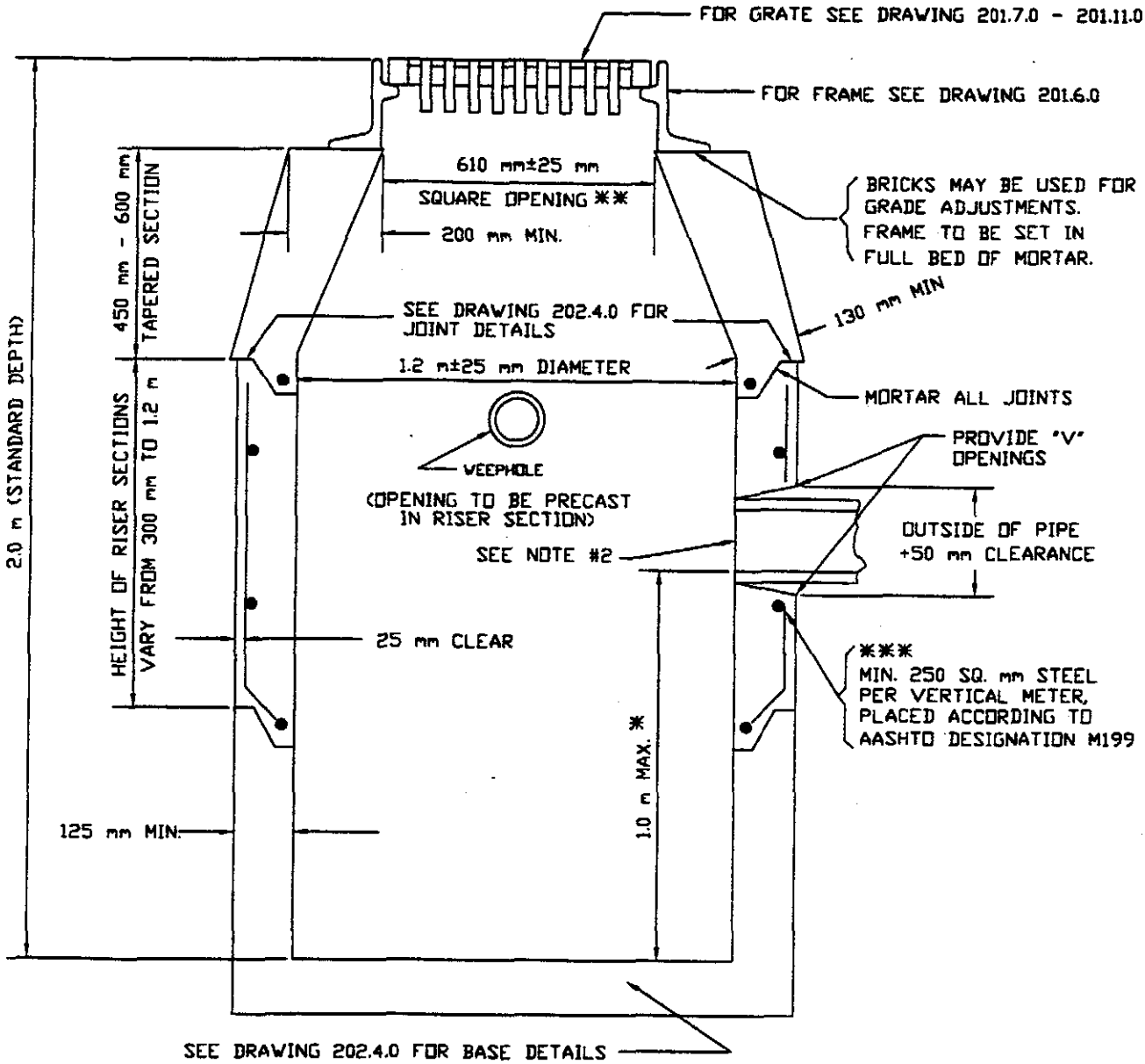


SECTION B-B

SOLID SECTION, OR FILL HOLE WITH BRICKS AND MORTAR, OR FILL WITH 30 MPa - 40 mm - 335 kg, OR 30 MPa - 20 mm - 390 kg CONCRETE. (IF CONCRETE IS HAND MIXED SEE LATEST SPECIFICATIONS.)

BLOCKS TO BE SET IN FULL BED OF CEMENT MORTAR

30 MPa - 40 mm - 335 kg OR 30 MPa - 20 mm - 390 kg CEM. CONC. OR PRECAST CONC. SECTIONAL PLATES. SEE ABOVE.



* MINIMUM DEPTH OF SUMP TO BE 600 mm

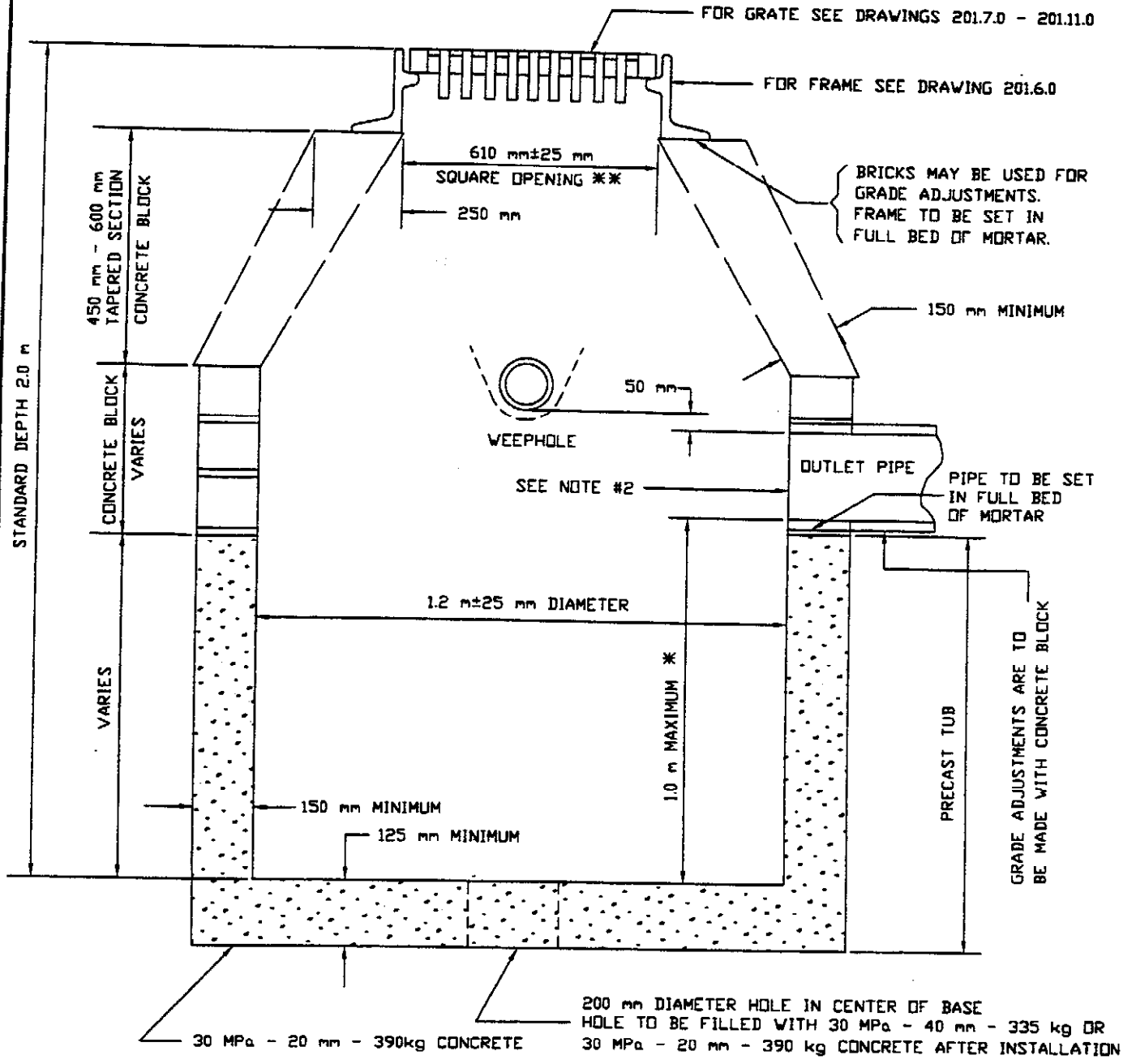
** WHEN A CURB INLET IS INSTALLED, THE OPENING IS TO BE 610 mm±25 mm X 685 mm±25 mm

*** REINFORCING STEEL BASED ON A WALL THICKNESS OF 125 mm.

NOTES:

1. DETAILS NOT INDICATED ABOVE ARE TO BE SIMILAR TO THOSE SHOWN ON 201.3.0
2. FACE OF PIPE FLUSH OR NOT TO PROJECT MORE THAN 100 mm FROM FACE OF WALL ALONG CENTERLINE OF PIPE.
3. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE STANDARD SPECIFICATIONS.
4. ALL CONCRETE TO BE AIR ENTRAINED

MASS HIGHWAY CONSTRUCTION STANDARDS	PRECAST CONCRETE CATCH BASIN	DATE OF ISSUE 9/22/95
		DRAWING NUMBER 201.4.0



* MINIMUM DEPTH OF SUMP TO BE 600 mm

** WHEN A CURB INLET IS INSTALLED, THE OPENING IS TO BE 610 mm±25 mm X 685 mm±25 mm

NOTES:

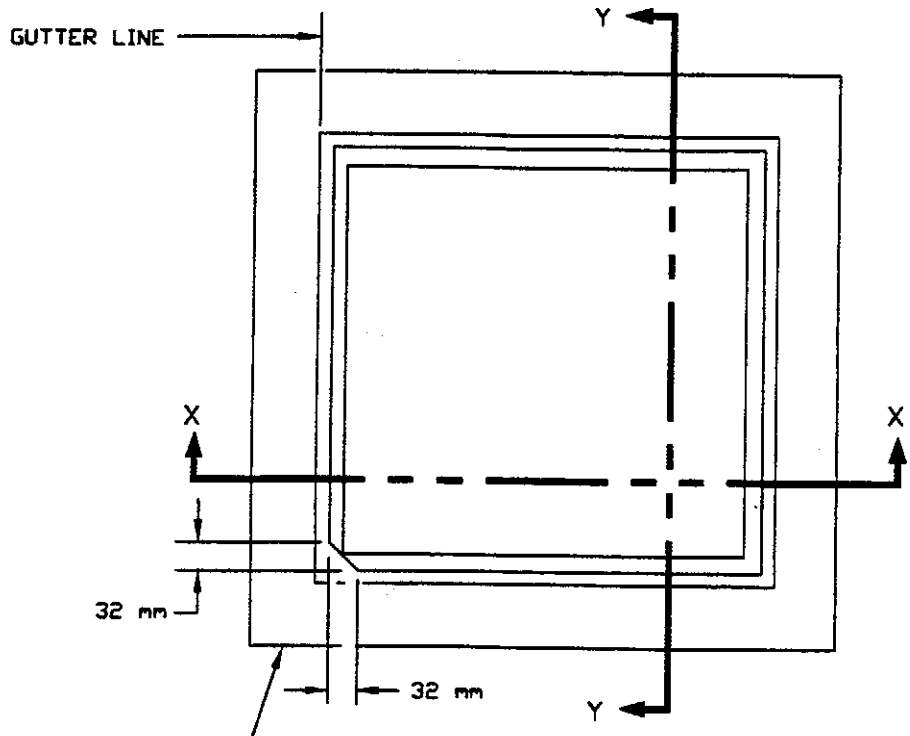
1. DETAILS NOT INDICATED ABOVE ARE TO BE SIMILAR TO THOSE SHOWN ON DRAWING 201.3.0
2. FACE OF PIPE FLUSH OR NOT TO PROJECT MORE THAN 100 mm FROM FACE OF WALL ALONG CENTERLINE OF PIPE.
3. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE STANDARD SPECIFICATIONS.
4. ALL CONCRETE TO BE AIR ENTRAINED

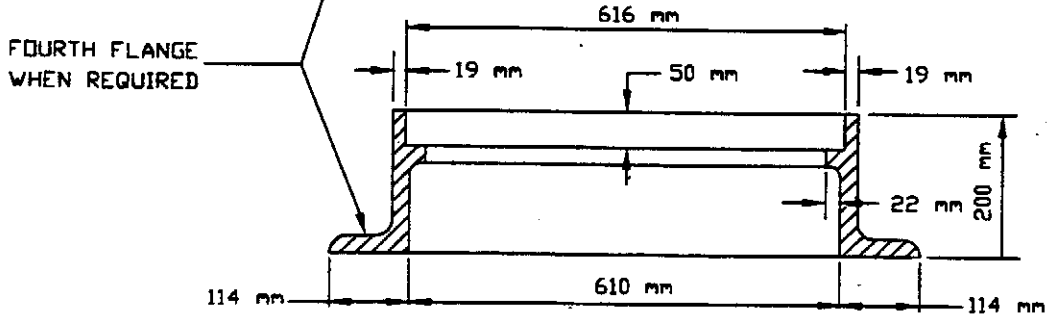
MASS HIGHWAY CONSTRUCTION STANDARDS

PRECAST CEMENT CONCRETE CATCH BASIN TUB

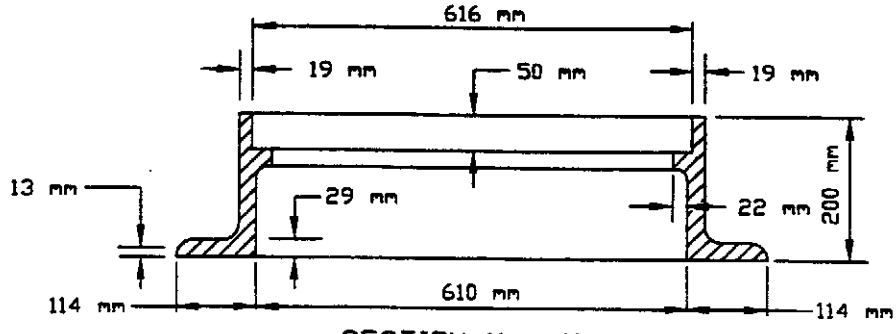
DATE OF ISSUE 9/22/95

DRAWING NUMBER **201.5.0**





SECTION X - X



SECTION Y - Y

NOTES:

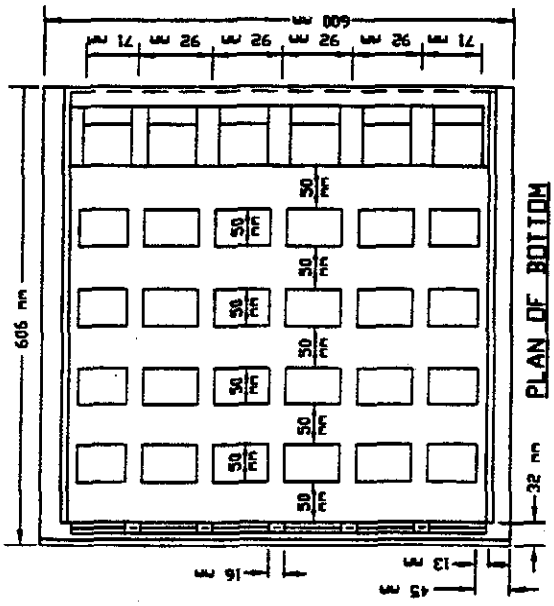
1. MINIMUM FRAME MASS:
   4 FLANGE - 134 KILOGRAMS
   3 FLANGE - 120 KILOGRAMS
2. MATERIAL - CAST IRON, SEE STANDARD SPECIFICATIONS
3. TO BE USED WITH STANDARD GRATES TYPE A-1, A-3 AND MASSACHUSETTS CASCADE GRATE

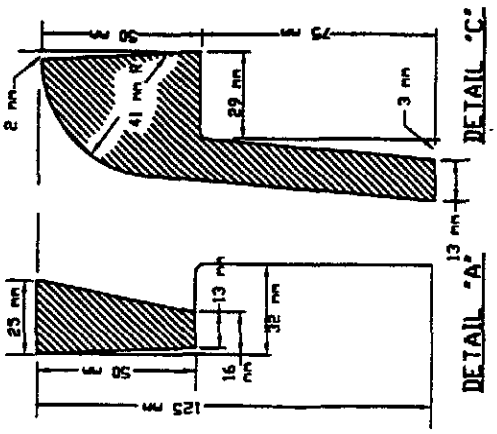
MASS HIGHWAY CONSTRUCTION STANDARDS

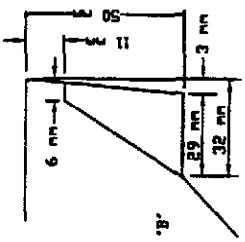
CATCH BASIN FRAME

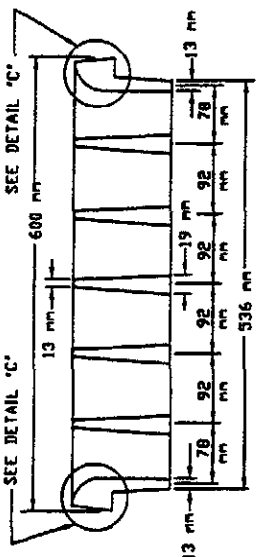
DATE OF ISSUE
9/22/95

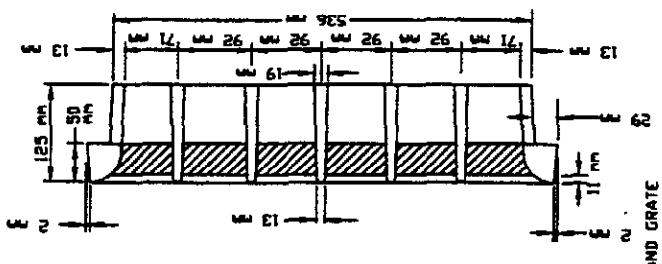
DRAWING NUMBER
201.6.0

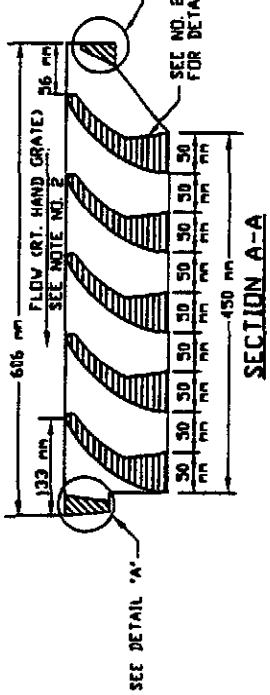


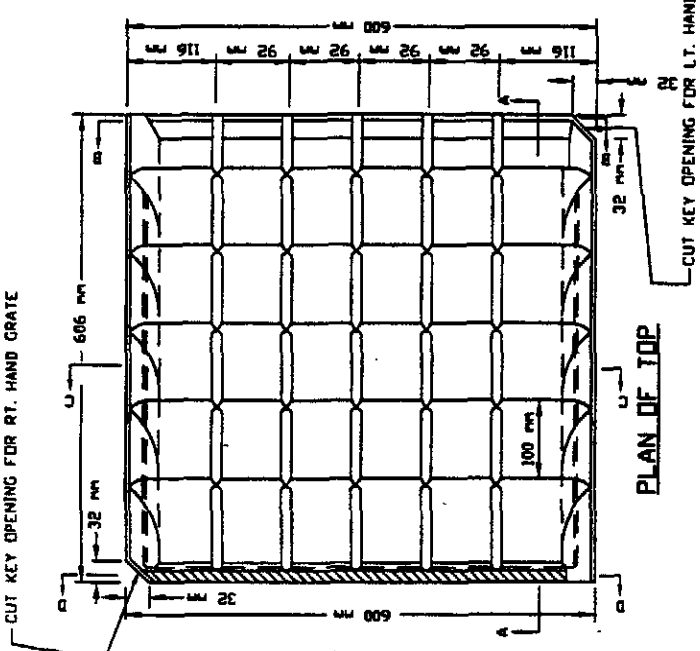


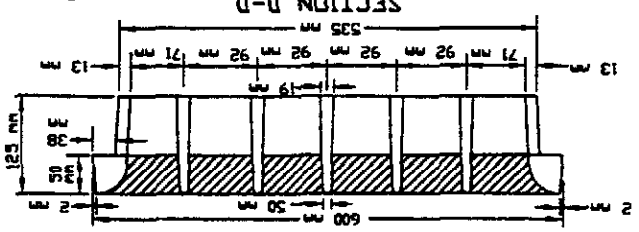












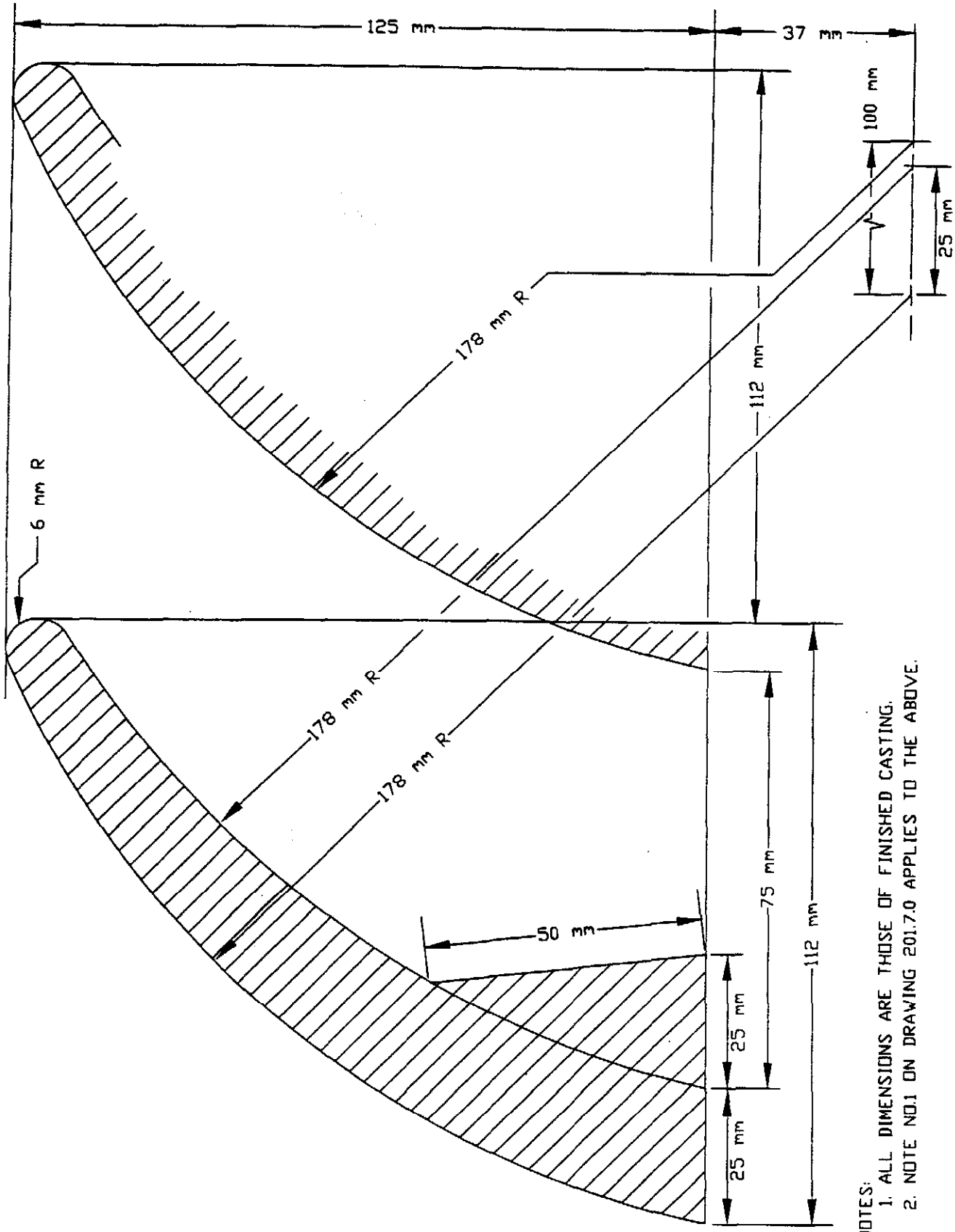
NOTES:
1. THIS CATCH BASIN GRATE IS PATENTED. THE PATENT HOLDER GRANTS FREE LICENSE TO ANY COMPANY TO MANUFACTURE AND SUPPLY THIS GRATE FOR HIGHWAY PROJECTS ONLY IN MASSACHUSETTS. THE ABOVE TO BE NOTED ON THE CONSTRUCTION PLANS WHEN APPLICABLE.
2. THE DETAILS OF THE GRATE AS SHOWN ABOVE IS FOR A WATER FLOW COMING FROM THE RIGHT (DESIGNATED AS A RIGHT GRATE). WHEN THE FLOW IS FROM THE LEFT (DESIGNATED LEFT GRATE) IT IS TO BE TURNED 180° FROM THE POSITION SHOWN ABOVE. THE DIRECTION OF FLOW SHOULD BE SHOWN ON THE DRAINAGE PLANS WHEN THE ABOVE GRATE IS USED.
3. THE GRATE IS NOT TO BE USED ON EXPRESSWAYS, FREEWAYS, ETC. IT IS ONLY PLACED ON FACILITIES WHERE BICYCLE TRAVEL IS LEGALLY ALLOWED. THE LOCAL COMMUNITY SHOULD BE MADE AWARE OF THE USE OF THESE GRATES. ON CHAPTER 90 PROJECTS, THEY MAY PREFER THERE OWN STANDARD GRATE.
4. THE GRATE IS TO BE MADE OF CAST IRON (SEE STANDARD SPECIFICATIONS).

MASS HIGHWAY
CONSTRUCTION STANDARDS

MASSACHUSETTS CASCADE GRATE

DATE OF ISSUE
9/22/95

DRAWING NUMBER
201.7.0



NOTES:
1. ALL DIMENSIONS ARE THOSE OF FINISHED CASTING.
2. NOTE NO.1 ON DRAWING 201.7.0 APPLIES TO THE ABOVE.

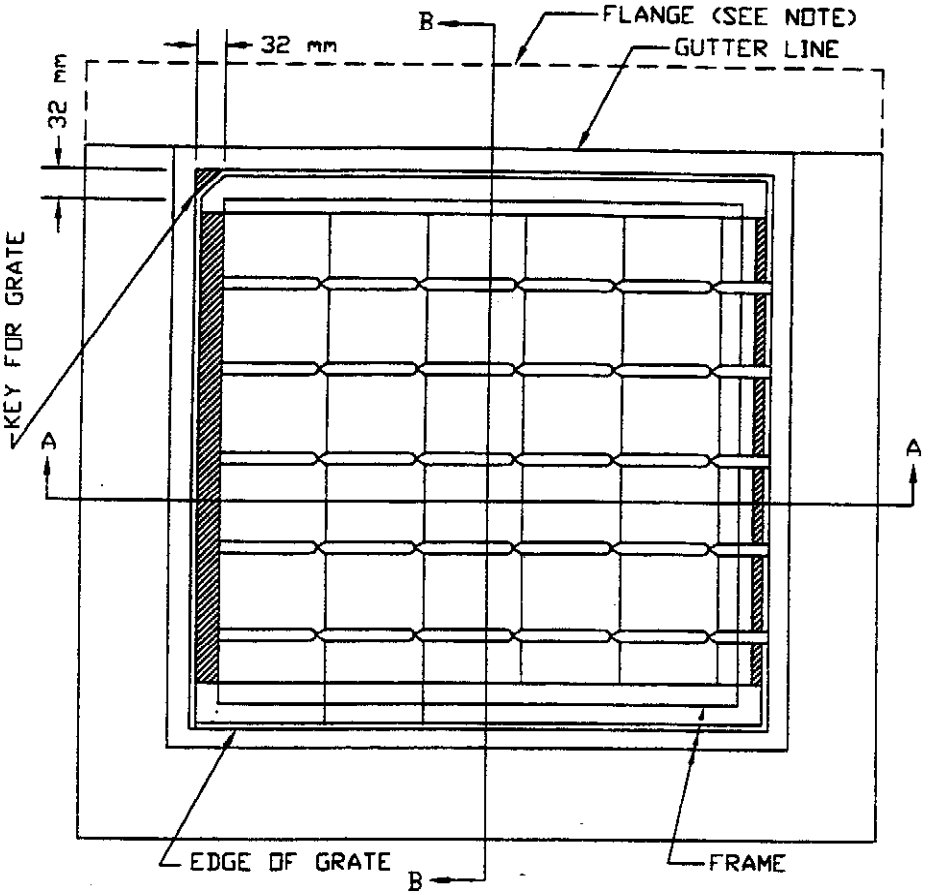
MASS HIGHWAY
CONSTRUCTION STANDARDS

CASCADE BAR DESIGN

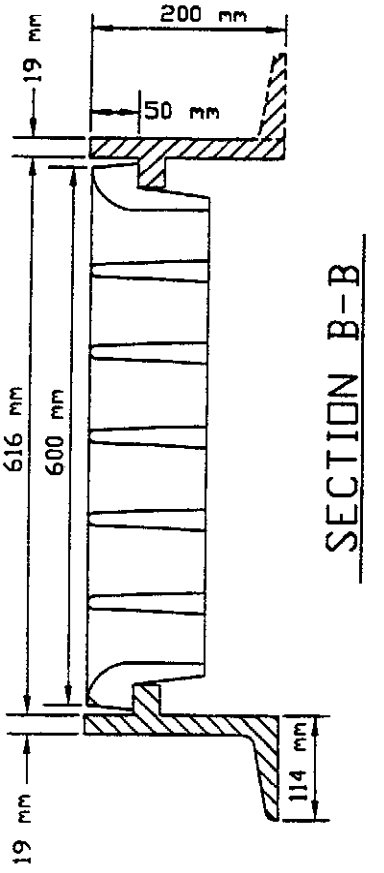
FOR MASSACHUSETTS CASCADE GRATE

DATE OF ISSUE
9/22/95

DRAWING NUMBER
201.8.0

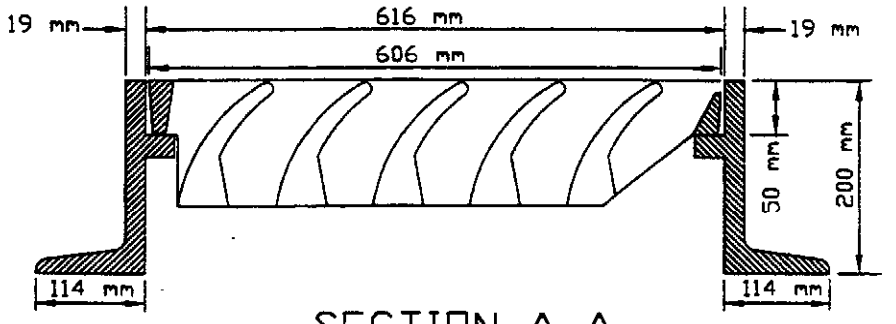


PLAN



SECTION B-B

FLOW (RIGHT HAND GRATE)
SEE NOTE NO.4

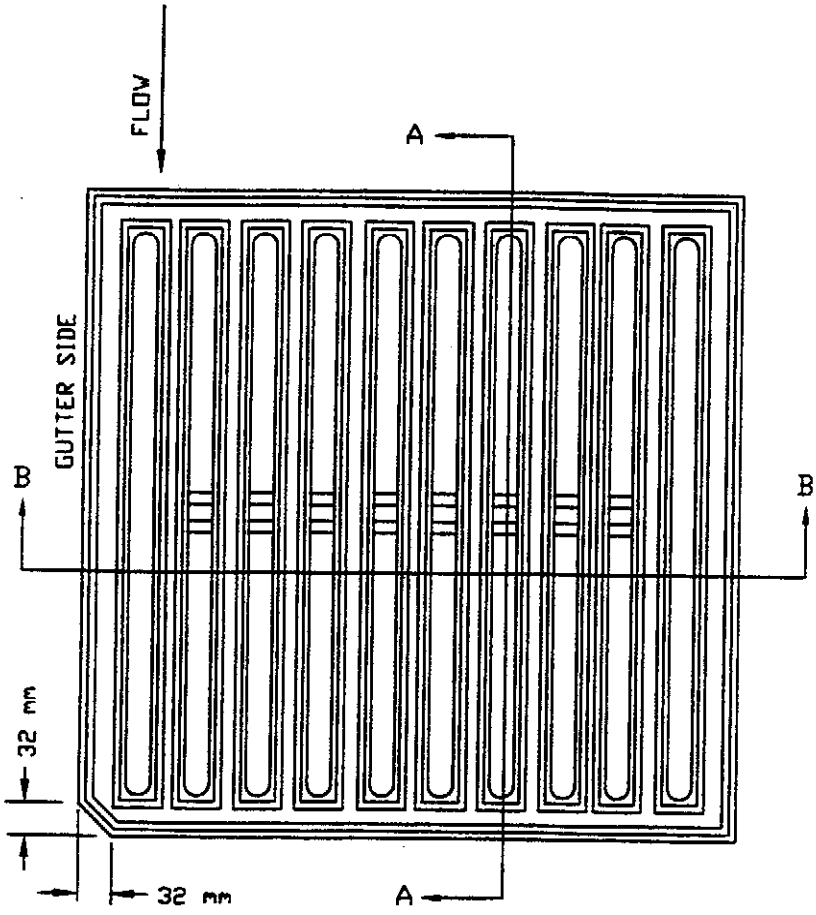


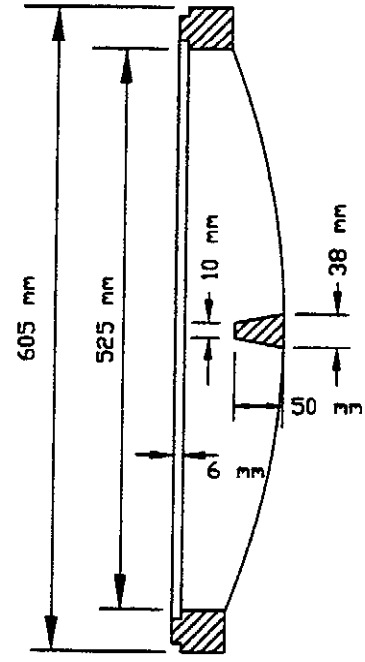
SECTION A-A

NOTES:

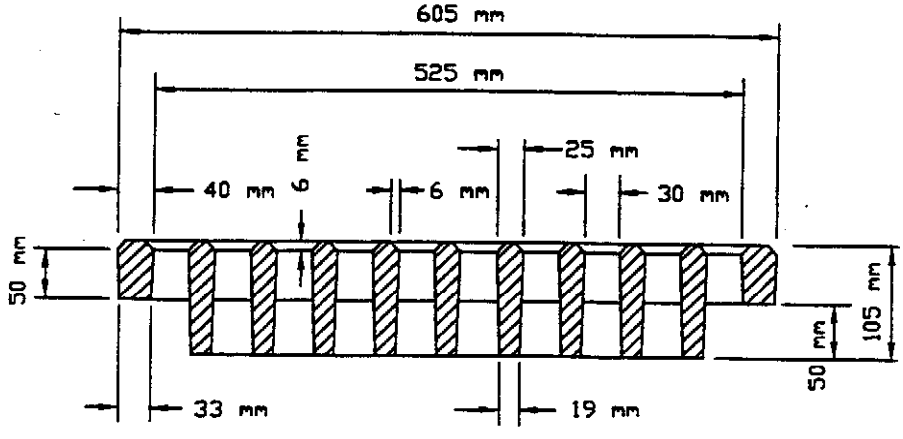
1. THE MASSACHUSETTS STANDARD FRAME IS TO BE USED, DETAILS AND DIMENSIONS NOT SHOWN ABOVE ARE TO BE THE SAME AS THOSE SHOWN ON DRAWING 201.6.0
2. A THREE (3) FLANGE FRAME IS TO BE USED WHEN A CURB INLET IS REQUIRED
3. GRATE DETAILS ARE SHOWN ON DRAWING 201.7.0
4. THE GRATE AS PLACED ABOVE, IS FOR WATER COMING FROM THE RIGHT. TURN THE GRATE 180° FOR A WATER FLOW FROM THE LEFT. SEE NOTE NO. 2 ON DRAWING 201.7.0
5. THE GRATE IS ONLY SHOWN SCHEMATICALLY

MASS HIGHWAY CONSTRUCTION STANDARDS	FRAME FOR MASSACHUSETTS CASCADE GRATE	DATE OF ISSUE 9/22/95 DRAWING NUMBER **201.9.0**





SECTION A-A



SECTION B-B

NOTES:

1. MATERIAL-CAST IRON; SEE STANDARD SPECIFICATIONS
2. MINIMUM MASS - 95 kg

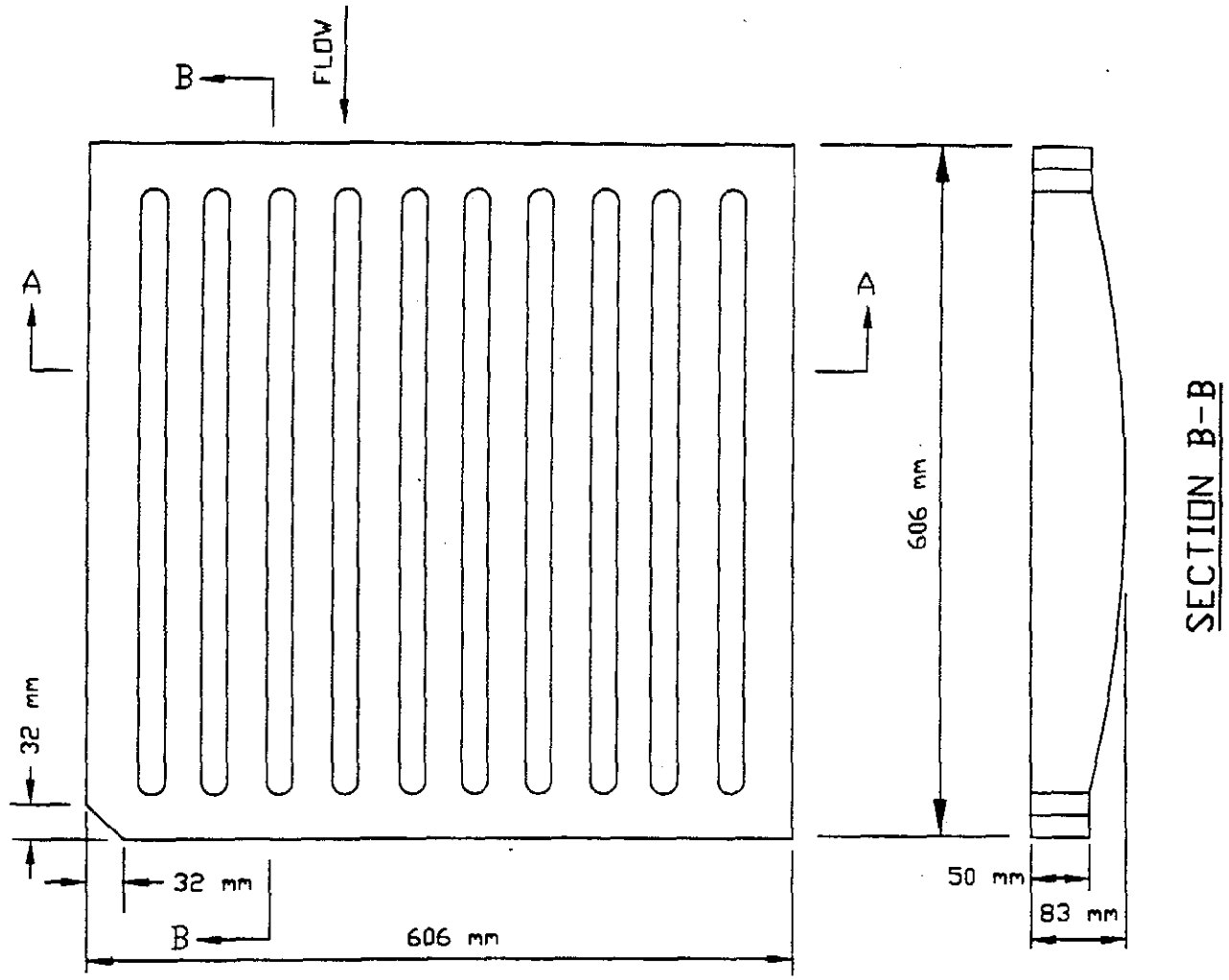
MASS HIGHWAY CONSTRUCTION STANDARDS

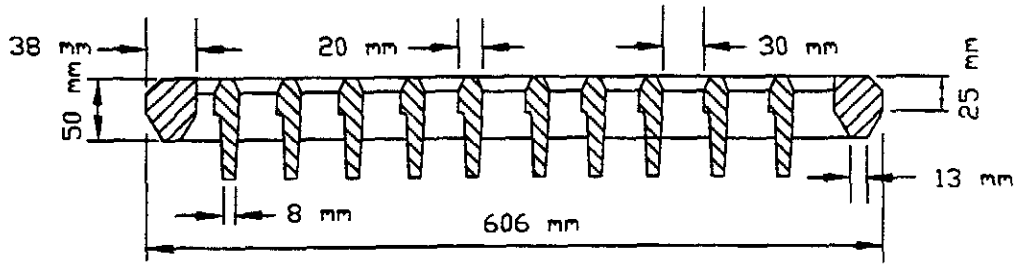
CATCH BASIN GRATE TYPE A-1

FOR FREEWAYS AND EXPRESSWAYS

DATE OF ISSUE 9/22/95

DRAWING NUMBER **201.10.0**





SECTION A-A

NOTES:
1. MATERIAL - CAST STEEL
2. MINIMUM MASS - 64 kg
3. FOR USE WITH CAST IRON FRAME AS SHOWN ON DRAWING 201.6.0

MASS HIGHWAY CONSTRUCTION STANDARDS

CATCH BASIN GRATE TYPE A-3

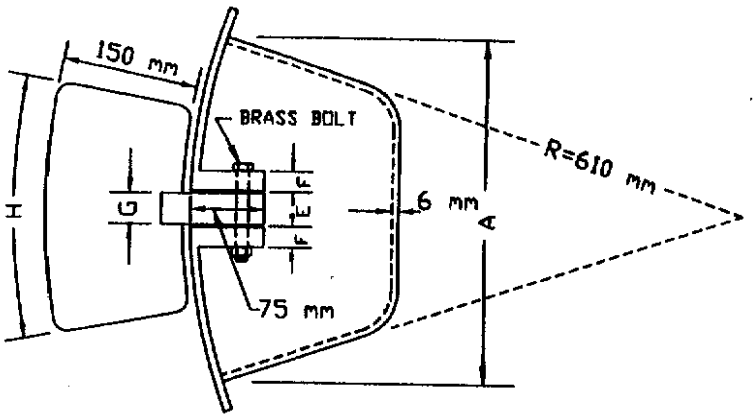
FOR FREEWAYS AND EXPRESSWAYS

DATE OF ISSUE 9/22/95

DRAWING NUMBER **201.11.0**

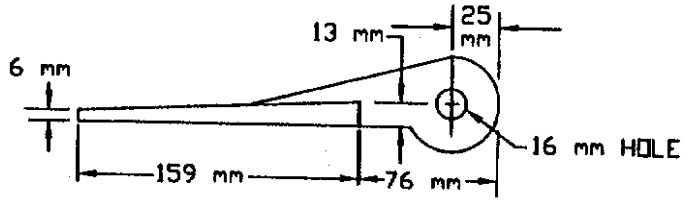
MASS HIGHWAY
CONSTRUCTION STANDARDS

CATCH BASIN HOOD

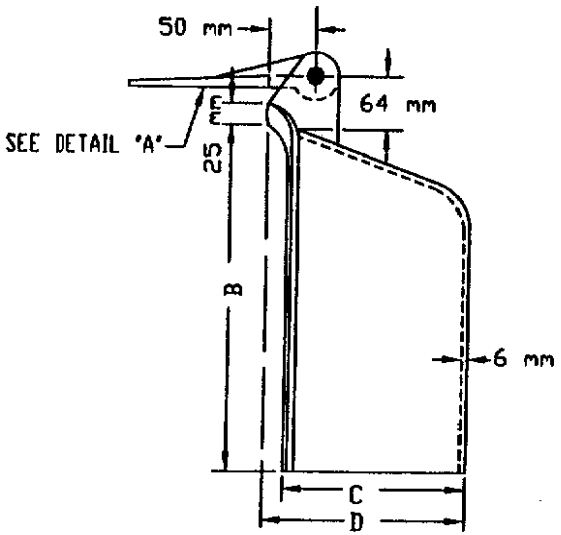


TOP

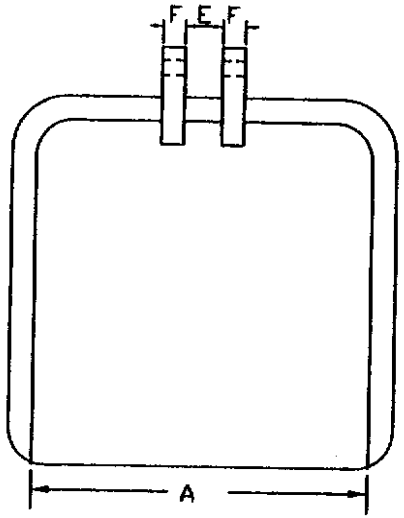
DIMENSIONS (mm)	A	B	C	D	E	F	G	H
200 and 250 PIPE	381	381	203	229	51	22	48	356
300 and 375 PIPE	457	457	254	286	51	25	48	356



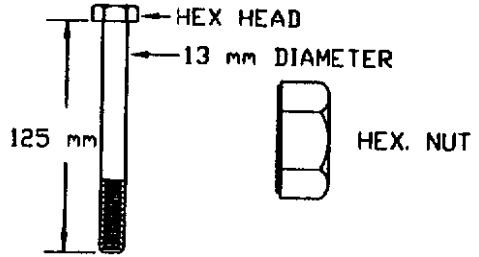
DETAIL "A" HINGE



SIDE



BACK

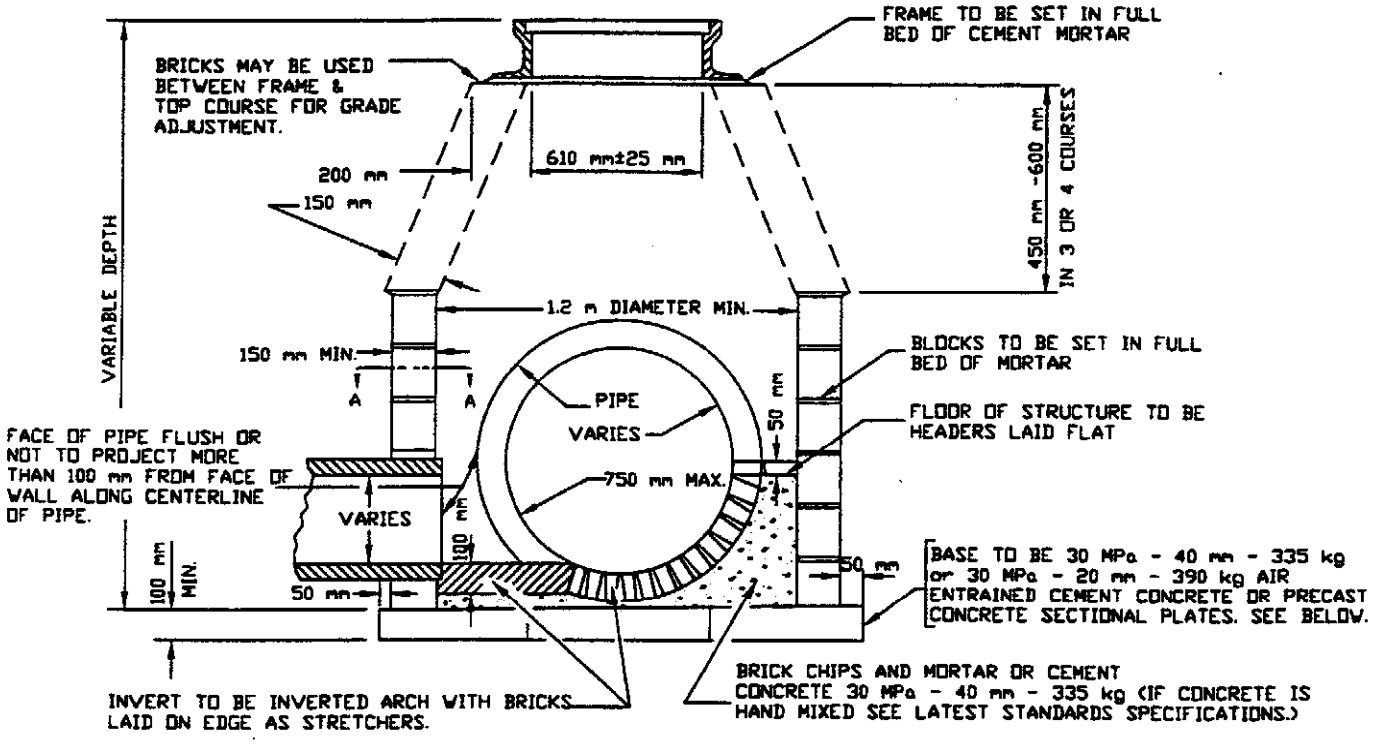


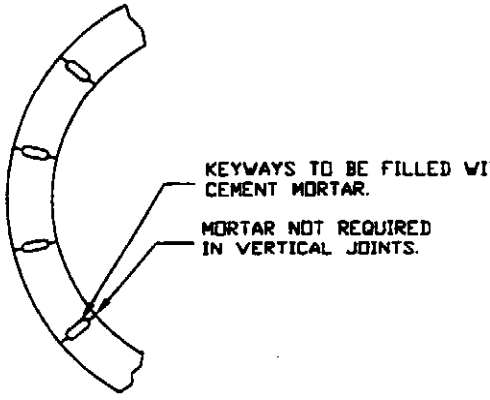
BRASS BOLT & NUT

NOTE:
1. HOODS TO BE GRAY CAST IRON AASHTO CLASS #30

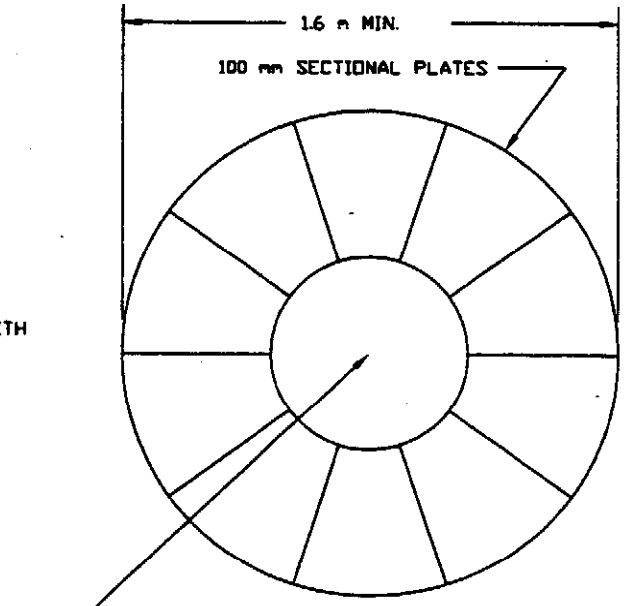
DATE OF ISSUE 9/22/95

DRAWING NUMBER 201.13.0





SECTION A-A



PLAN OF BASE

SOLID SECTION; OR FILL HOLE WITH BRICKS AND MORTAR; OR FILL WITH 30 MPa - 40 mm - 335 kg or 30 MPa - 20 mm - 390 kg CONCRETE. (IF CONCRETE IS HAND MIXED SEE LATEST STANDARD SPECIFICATIONS.)

NOTE:
1. DESIGN SHOWN IS FOR MANHOLE OF 3.0 METERS OR LESS AND PIPE DIAMETER OF 750 mm OR LESS.
2. STANDARD MANHOLE DEPTH TO BE 2.0 METERS OR LESS

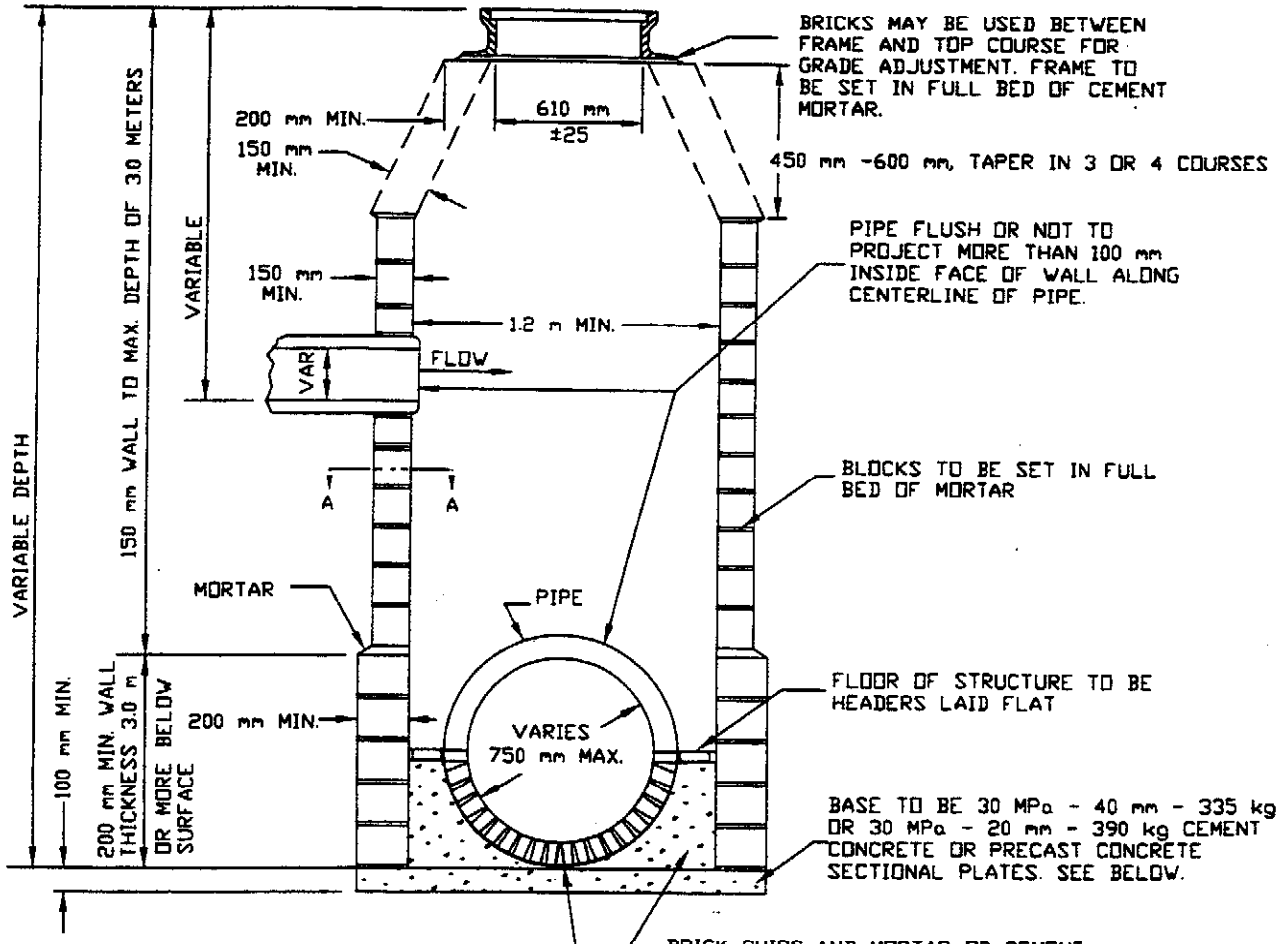
MASS HIGHWAY
CONSTRUCTION STANDARDS

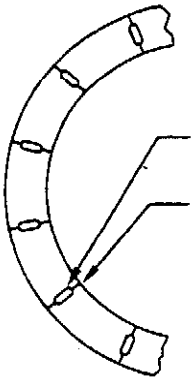
CONCRETE BLOCK MANHOLES

MANHOLES 3.0 METERS OR LESS IN DEPTH

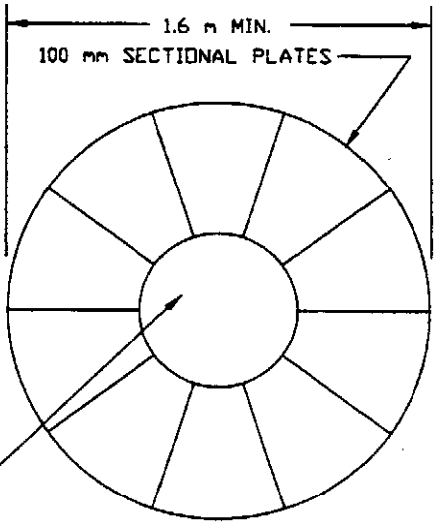
DATE OF ISSUE
9/22/95

DRAWING NUMBER
202.2.0





SECTION A-A



PLAN OF BASE

SOLID SECTION; OR FILL HOLE WITH BRICKS AND MORTAR; OR FILL WITH 30 MPa - 40mm - 335 kg OR 30 MPa - 20 mm - 390 kg CONCRETE. (IF CONCRETE IS HAND MIXED SEE LATEST STANDARD SPECIFICATIONS.)

NOTE:

1. MANHOLE DESIGN IS FOR PIPE DIAMETER OF 750 mm OR LESS

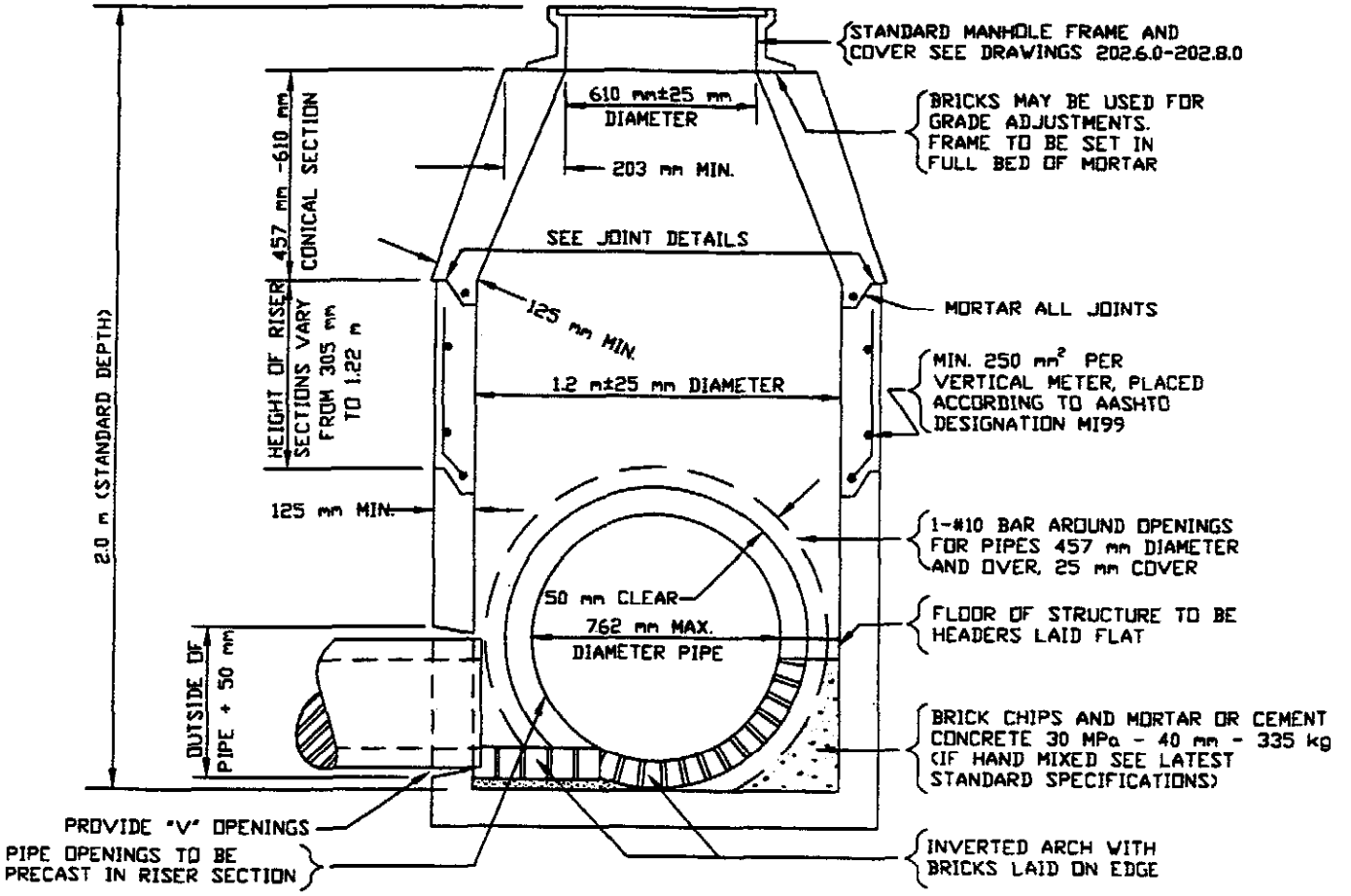
MASS HIGHWAY
CONSTRUCTION STANDARDS

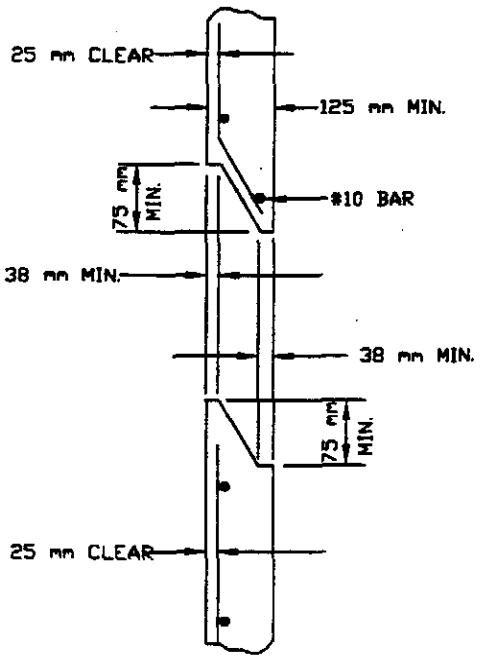
CONCRETE BLOCK MANHOLES

MANHOLES OVER 3.0 METERS IN DEPTH

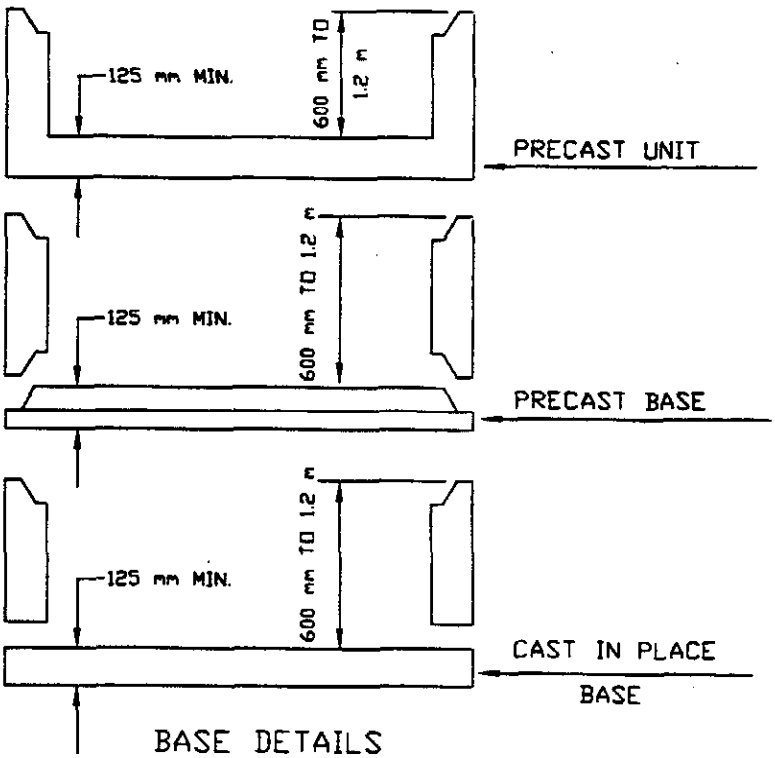
DATE OF ISSUE
9/22/95

DRAWING NUMBER
202.3.0





JOINT DETAILS



BASE DETAILS

NOTE:

1. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE LATEST STANDARD SPECIFICATIONS.

MASS HIGHWAY CONSTRUCTION STANDARDS

PRECAST CONCRETE MANHOLES

3.0 METERS OR LESS IN DEPTH

DATE OF ISSUE 9/22/95

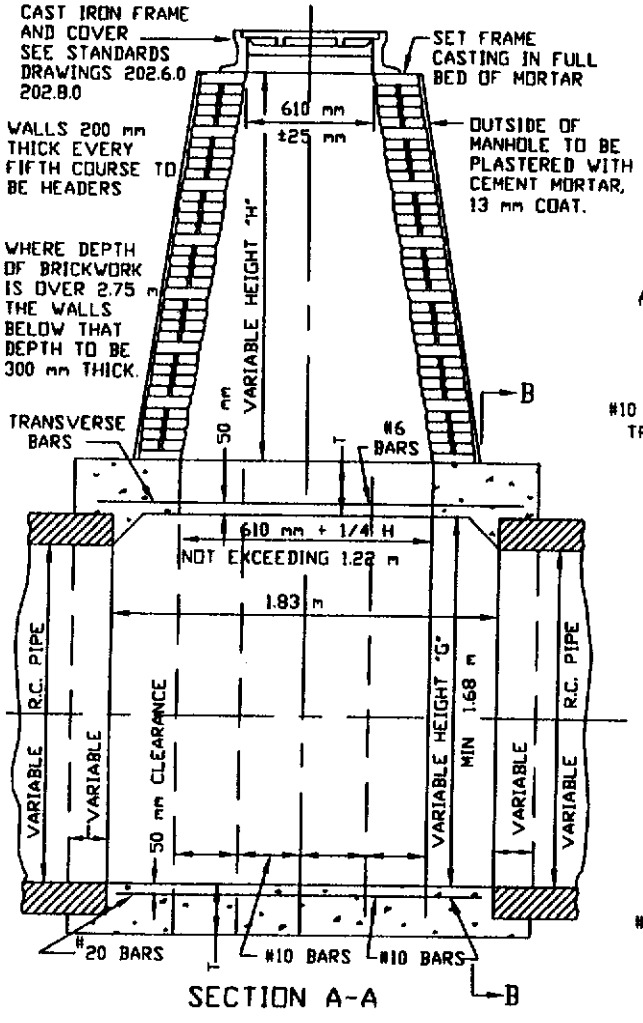
DRAWING NUMBER **202.4.0**

MASS HIGHWAY
CONSTRUCTION STANDARDS

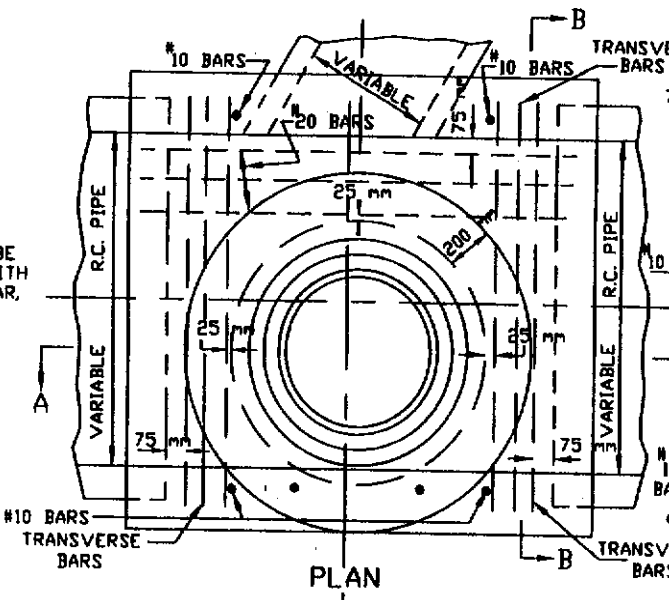
SPECIAL MANHOLES FOR 900 mm TO 2.13 m DIAMETER R.C. PIPE

DRAWING NUMBER **202.5.0**

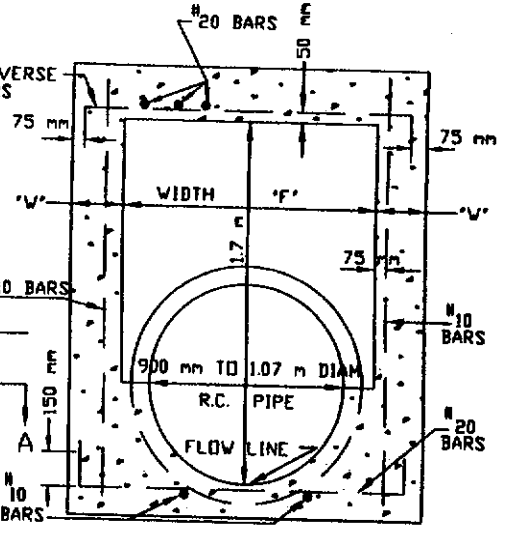
DATE OF ISSUE 9/22/95



SECTION A-A

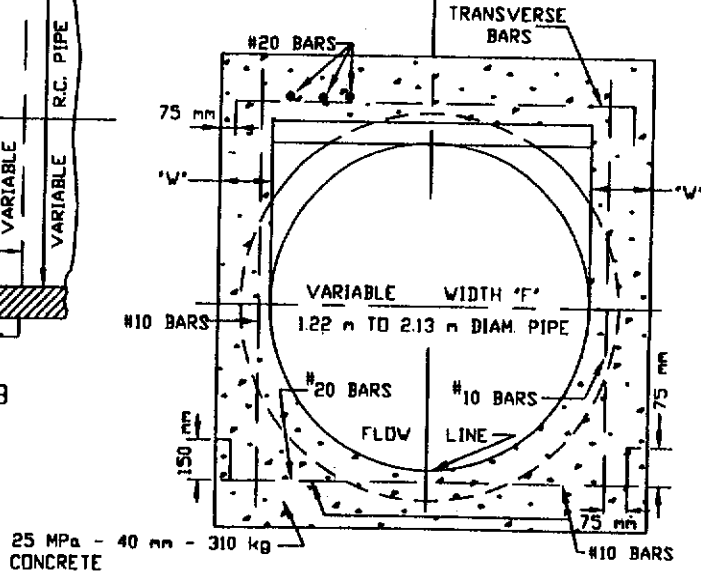


PLAN



900 mm TO 1.07 m DIAM. R.C. PIPE

SECTION B-B



1.22 m TO 2.13 m DIAM. R.C. PIPE

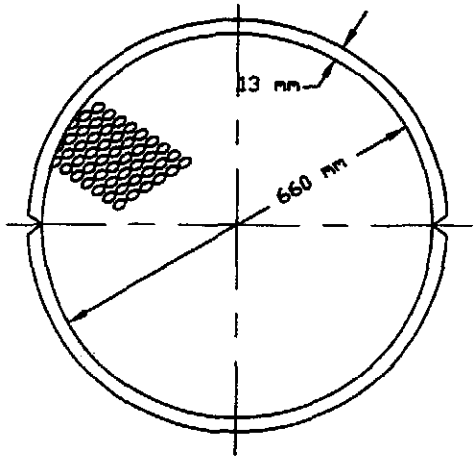
SECTION B-B

TOP AND BOTTOM SLABS & SIDEWALLS TO BE 25 MPa - 40 mm - 310 kg CONC.

SIZE OF PIPE m	WIDTH "F" m	HEIGHT "G" m	HEIGHT "H" mm					
			2.44-4.85		4.88-7.28		7.32&UP	
			T	W	T	W	T	W
0.90	1.22	1.68	203	254	203	305	229	305
1.07	1.22	1.68	203	254	203	305	229	305
1.22	1.22	1.68	203	254	203	305	229	305
1.37	1.37	1.68	203	254	203	305	254	305
1.52	1.52	1.68	203	254	229	305	279	305
1.83	1.83	1.83	229	254	254	305	305	305
2.13	2.13	2.13	254	254	254	305	305	305

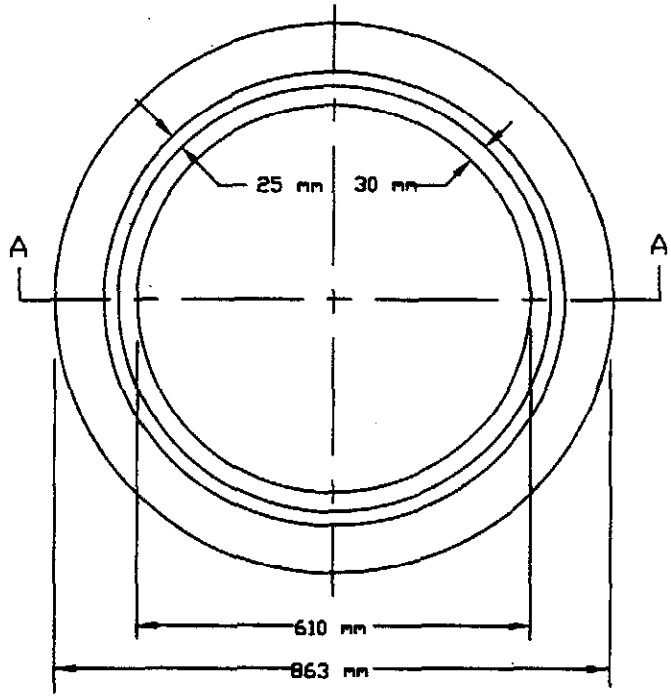
SIZE NUMBER AND SPACING OF BARS.

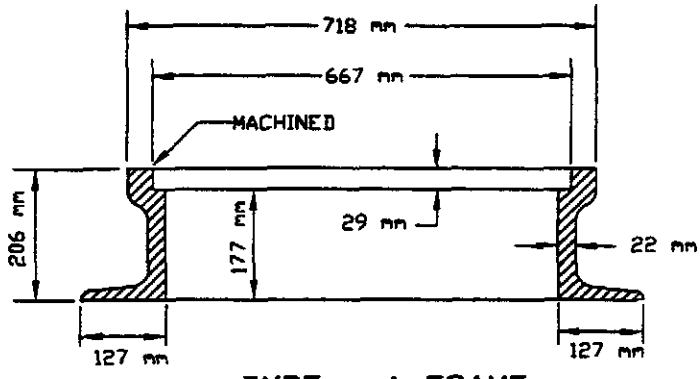
T mm	TOP SLAB		BOTTOM SLAB mm		SIDEWALLS
	TRANS. BARS	LONG BARS	TRANS. #20 BARS	LONG #10 BARS	VERTICAL #10 BARS
203	6-#20	3-#20	165 OC	600 OC	300 OC
229	6-#20	3-#20	140 OC	DO	DO
254	6-#25	3-#20	125 OC	DO	DO
279	6-#25	3-#20	115 OC	DO	DO
305	6-#30	3-#20	100 OC	DO	DO
330	6-#30	3-#20	100 OC	DO	DO



STANDARD COVER

FOR COVER DETAILS SEE DRAWING 202.8.0





TYPE - A FRAME

NOTES:

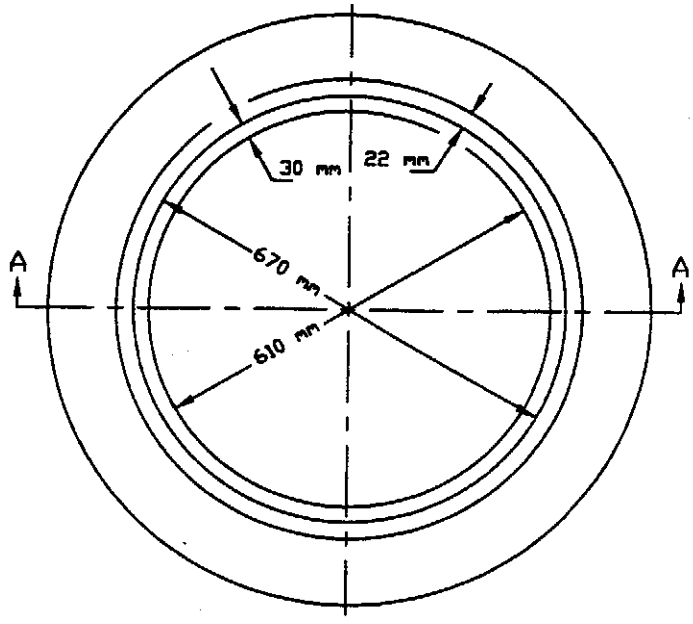
1. MINIMUM MASS - 120 kg
2. MATERIAL - CAST IRON

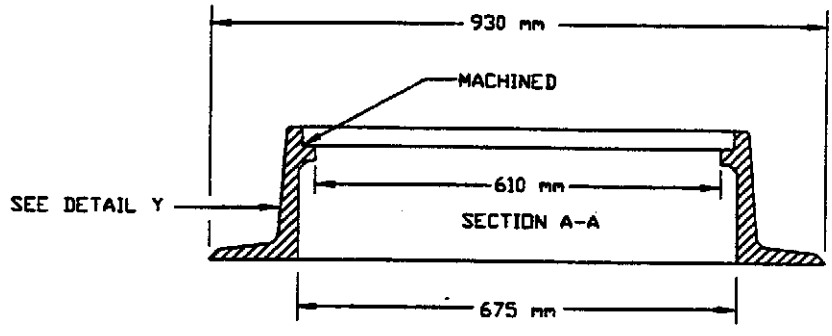
MASS HIGHWAY CONSTRUCTION STANDARDS

MANHOLE FRAME AND COVER

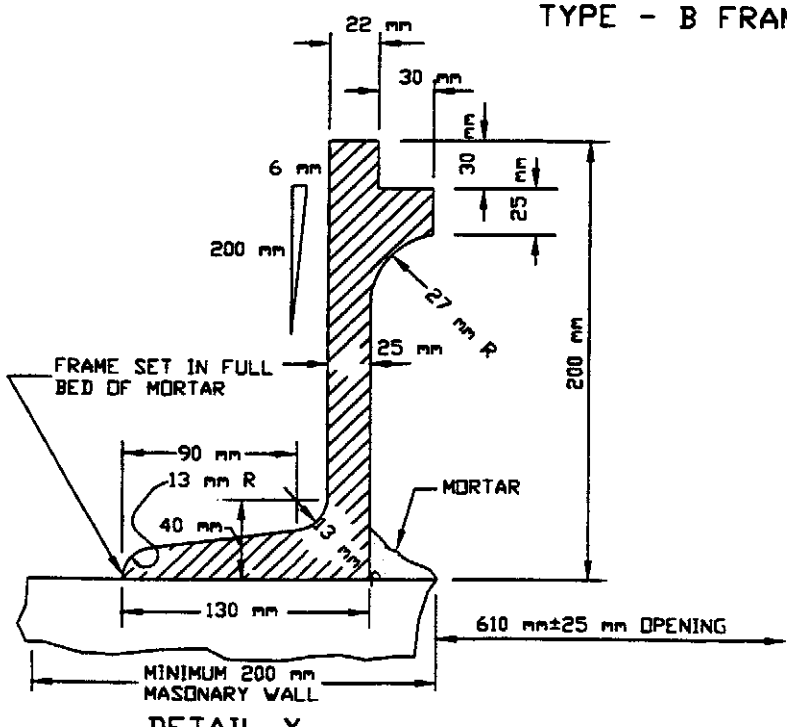
DATE OF ISSUE 9/22/95

DRAWING NUMBER **202.6.0**

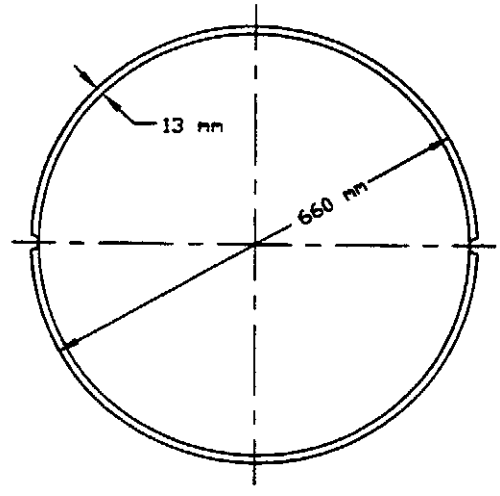




TYPE - B FRAME



DETAIL Y



STANDARD COVER

FOR COVER DETAIL, SEE DRAWING 202.8.0

NOTES:

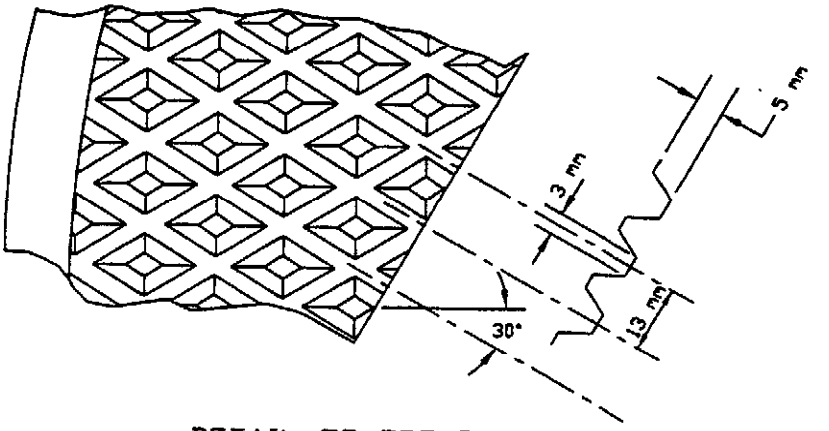
1. MINIMUM FRAME MASS 120 kg
2. MATERIAL - CAST IRON

MASS HIGHWAY CONSTRUCTION STANDARDS

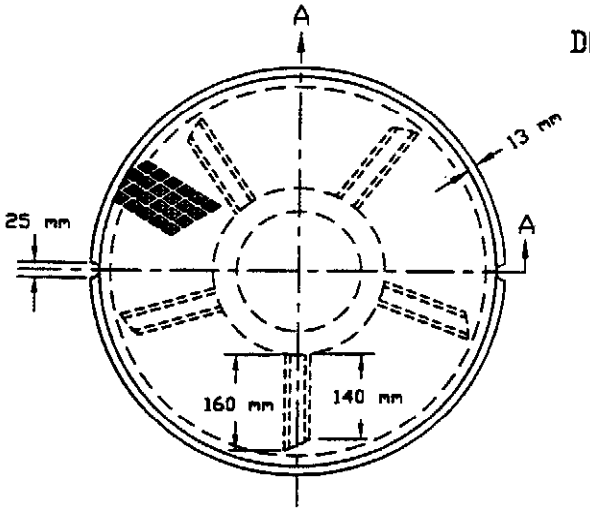
MANHOLE FRAME AND COVER

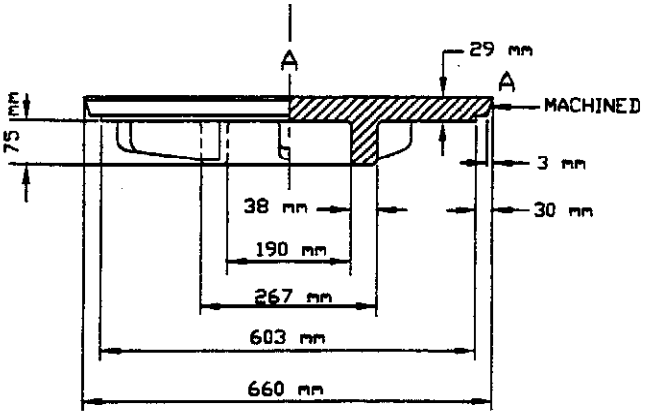
DATE OF ISSUE 9/22/95

DRAWING NUMBER 202.7.0

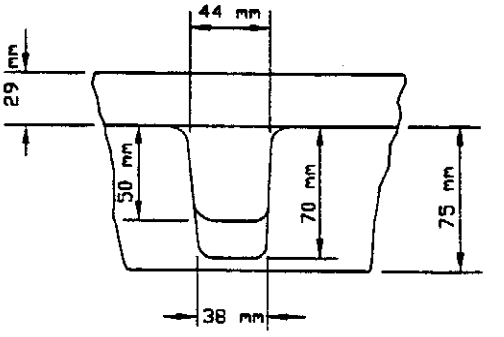


DETAIL OF TREAD





MANHOLE COVER FOR TYPE A & B FRAMES



DETAIL OF FIN

NOTES:
1. MATERIAL - CAST IRON: SEE STANDARD SPECIFICATIONS.
2. MINIMUM COVER MASS - 91.0 kg

MASS HIGHWAY CONSTRUCTION STANDARDS

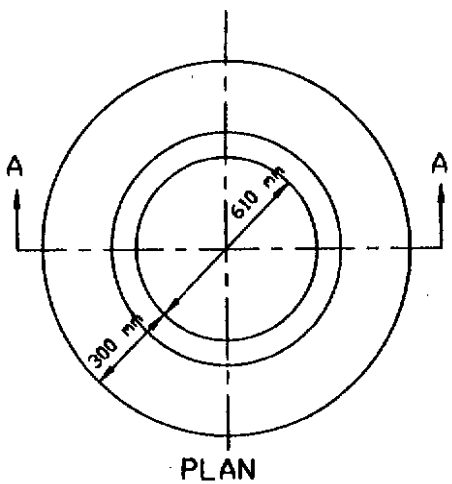
MANHOLE COVER DETAILS

DATE OF ISSUE 9/22/95

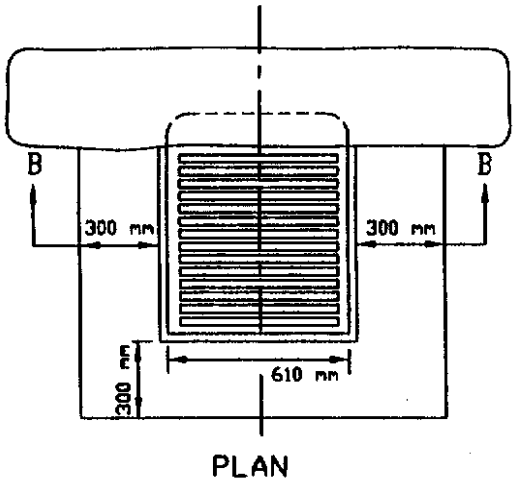
DRAWING NUMBER 202.8.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

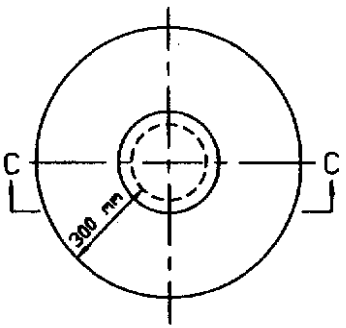
CONCRETE COLLARS



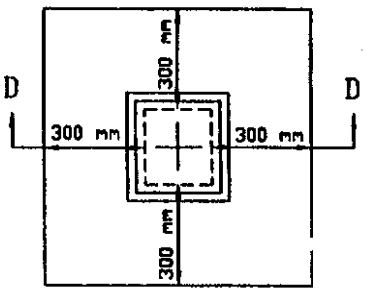
PLAN



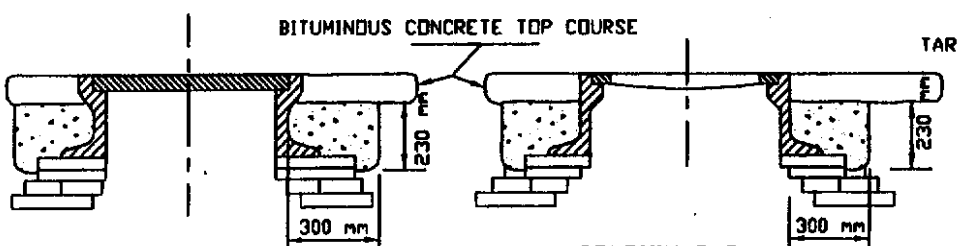
PLAN



PLAN



PLAN

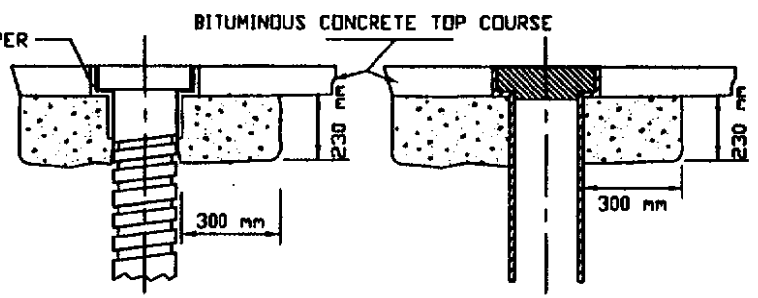


SECTION A-A

MANHOLES

SECTION B-B

CATCH BASIBS



SECTION C-C

ROUND

SECTION D-D

SQUARE

WATER SERVICE BOXES

NOTES:

1. COLLARS TO BE 30 MPa - 40 mm - 335 kg CEMENT CONCRETE MASONARY REGULAR OR H.E.S. AS DIRECTED (IF HAND MIXED, SEE LATEST STANDARD SPECIFICATIONS).
2. NO CONCRETE REQUIRED IN CONCRETE PAVEMENT.

DATE OF ISSUE 9/22/95

DRAWING NUMBER 202.9.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

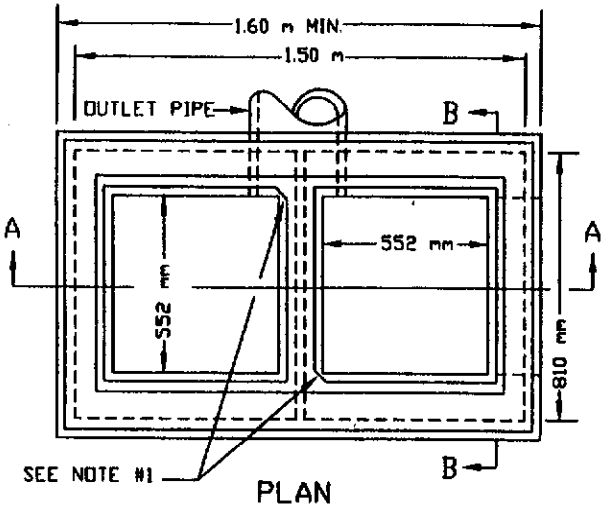
DROP INLETS

TYPE A 30MPa-40mm-335kg CONCRETE

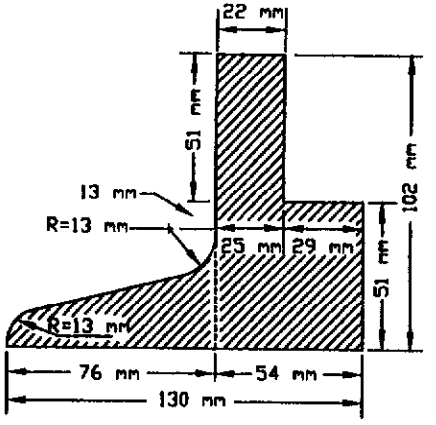
TYPE B - CONCRETE BLOCK

DATE OF ISSUE 9/22/95

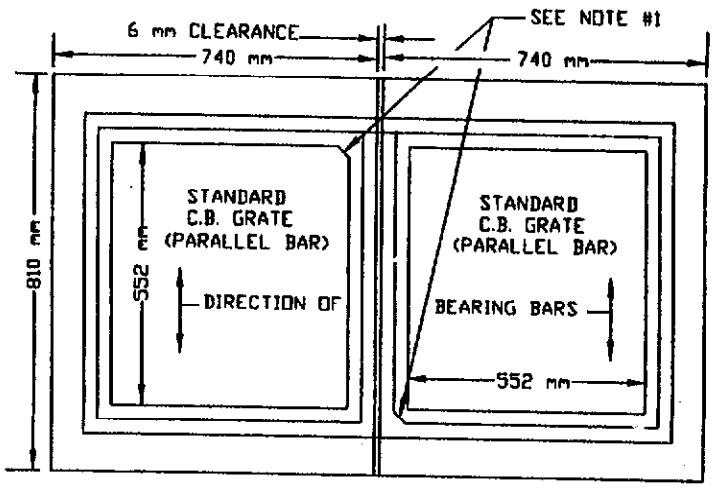
DRAWING NUMBER 203.1.0



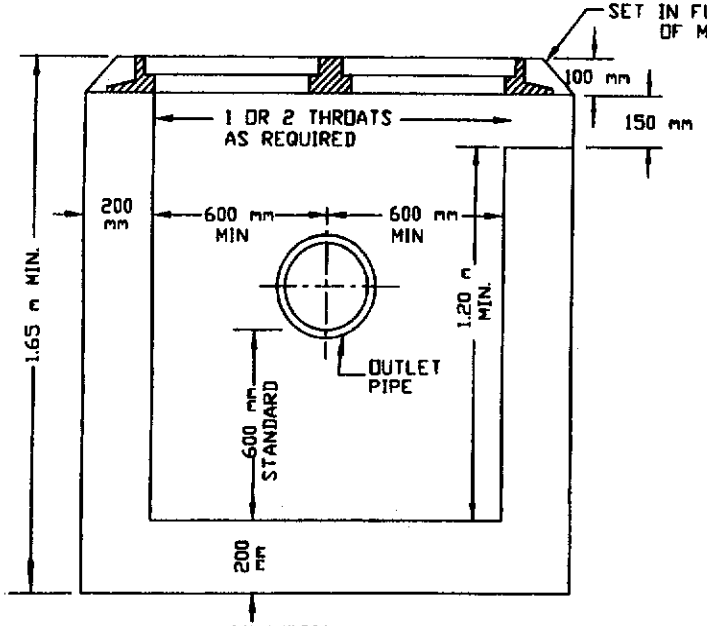
PLAN



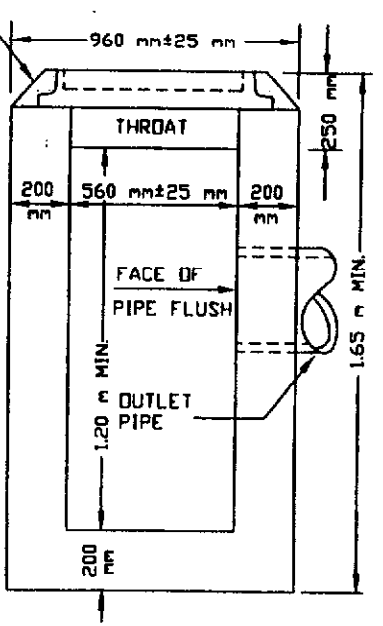
FRAME SECTIONS



2-3 FLANGE 102 mm C.I. FRAMES



SECTION A-A



SECTION B-B

NOTES:

1. STANDARD PARALLEL BAR GRATES TO BE USED. SEE DETAILS ON DRAWINGS 201.10.0, 201.11.0
2. MINIMUM C.I. FRAME MASS - 93 kg EACH
3. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS SEE LATEST STANDARD SPECIFICATIONS

TYPE "A"

4. 30 MPa - 40 mm - 335 kg CEMENT CONCRETE

TYPE "B"

5. NOMINAL CONCRETE BLOCK DIMENSIONS
   HEIGHT, 100 mm TO 200 mm
   WIDTH, 200 mm
   LENGTH, 200 mm TO 400 mm
6. BLOCKS TO BE SET IN FULL BED OF MORTAR
7. THIS DROP INLET IS NOT TO BE USED AT ANY LOCATION WHERE IT MAY PRESENT A HAZARD TO VEHICLES THAT RUN OFF THE ROAD. FOR FLUSH TYPE SEE DRAWING 203.2.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

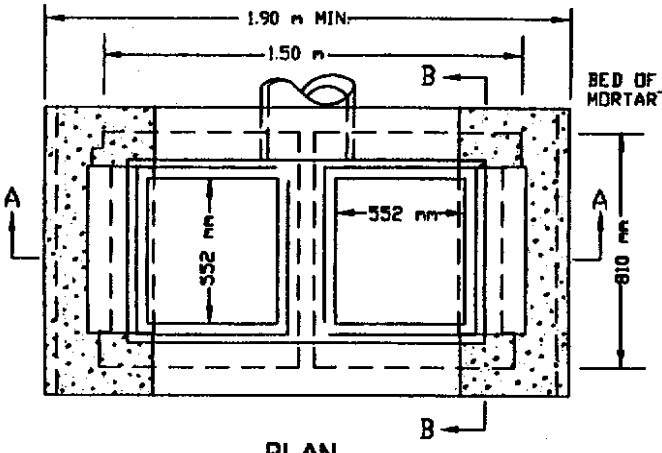
DROP INLETS

TYPE AF 30MPa-40mm-335kg CONCRETE

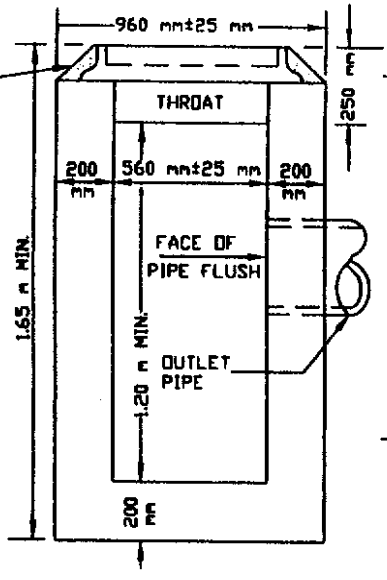
TYPE BF - CONCRETE BLOCK

DATE OF ISSUE 9/22/95

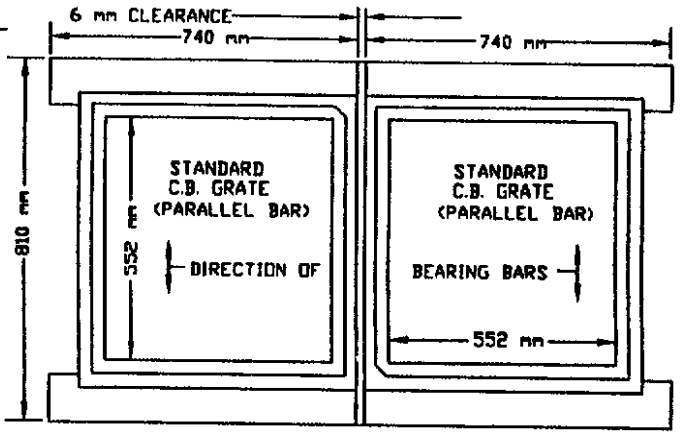
DRAWING NUMBER 203.2.0



PLAN

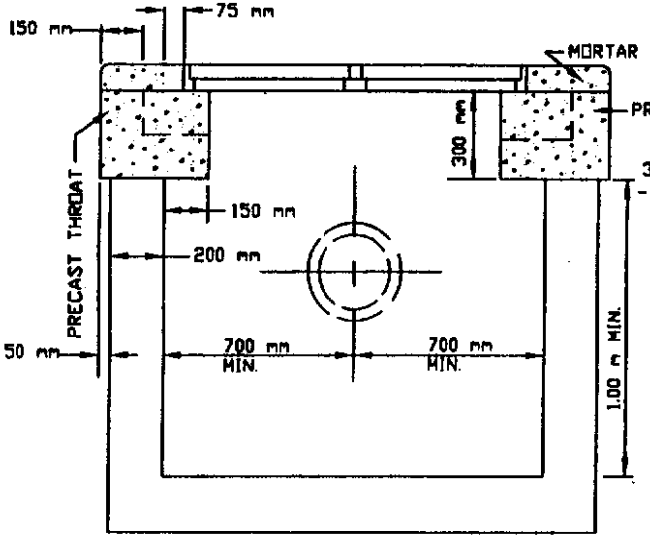


SECTION B-B

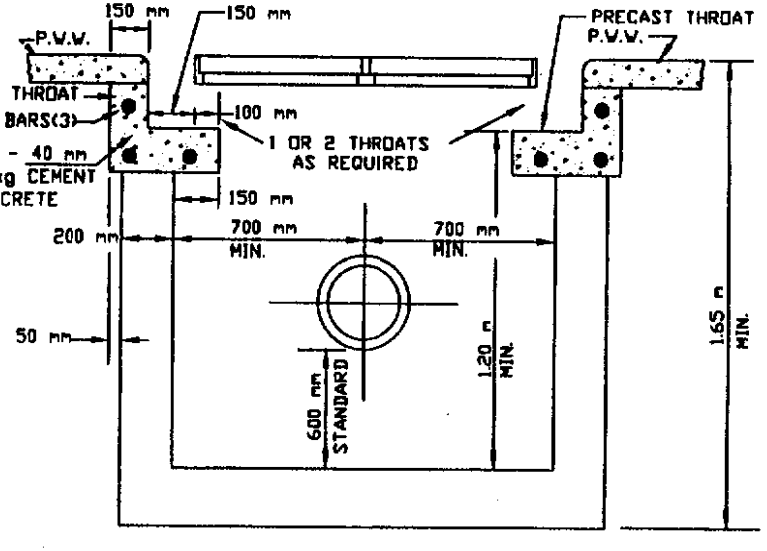


EXCESS FLANGE AREA TO BE REMOVED

2-3 FLANGE 102 mm C.I. FRAMES



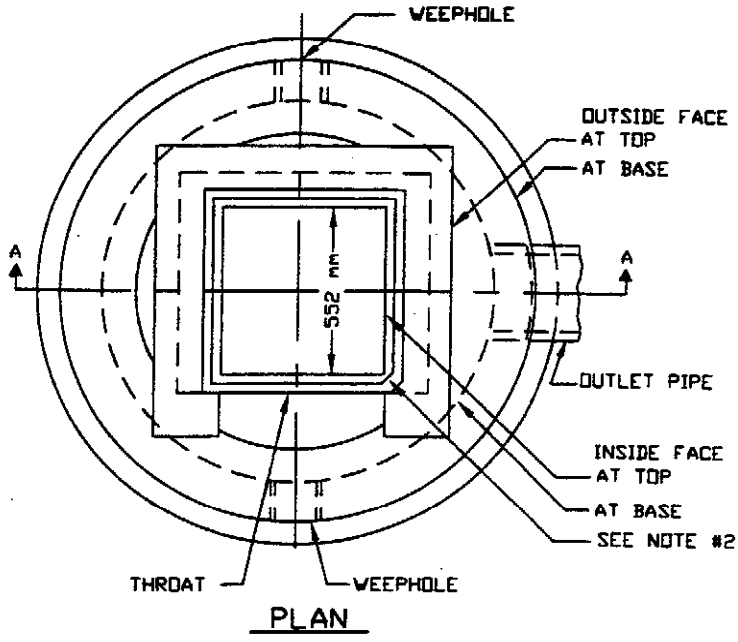
ELEVATION



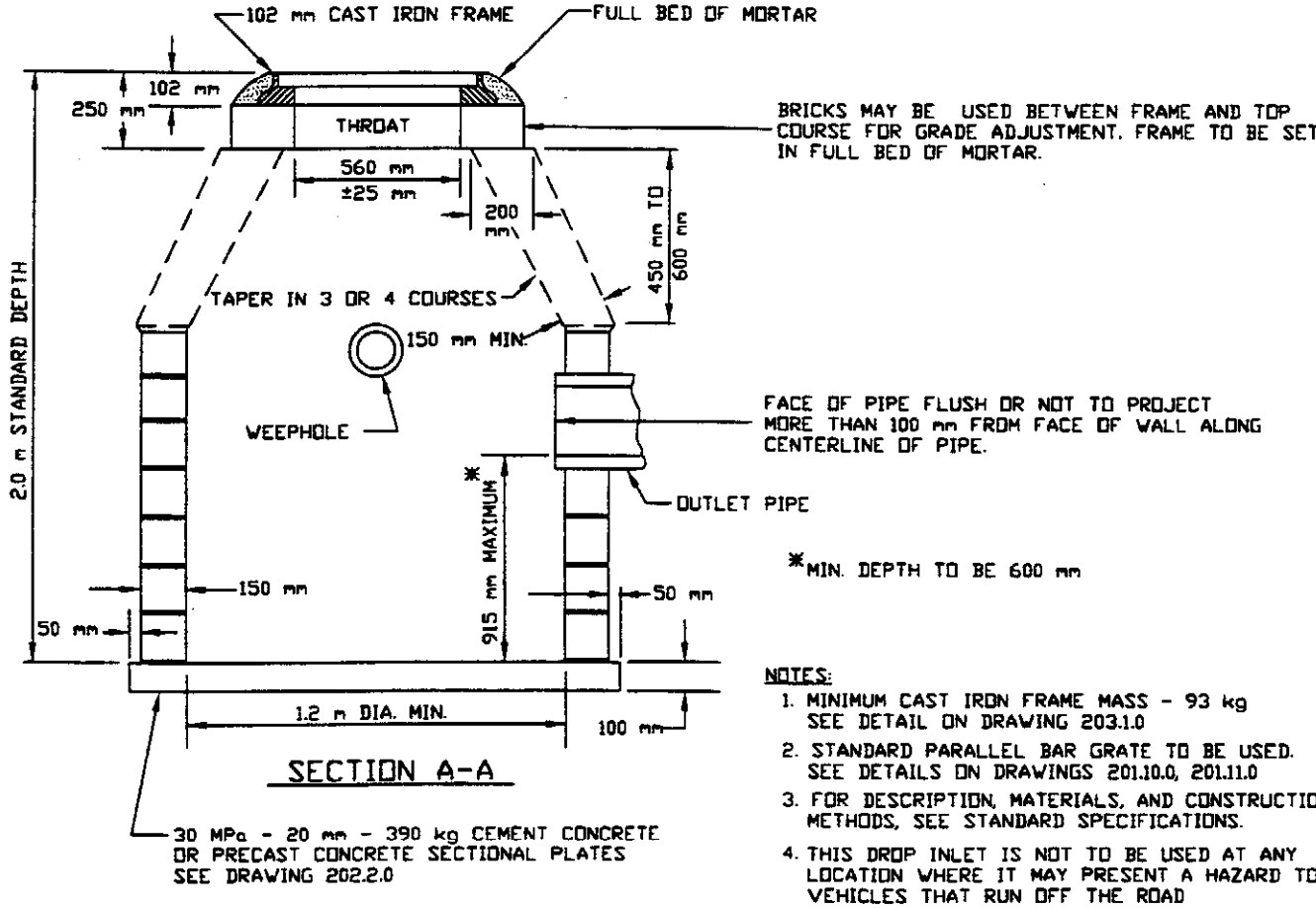
SECTION A-A

NOTES:

1. FOR DETAILS OF PRECAST THROAT SEE DRAWING 203.7.0
2. SEE DRAWING 203.1.0 FOR DETAILS NOT SHOWN



PLAN



SECTION A-A

NOTES:

1. MINIMUM CAST IRON FRAME MASS - 93 kg SEE DETAIL ON DRAWING 203.1.0
2. STANDARD PARALLEL BAR GRATE TO BE USED. SEE DETAILS ON DRAWINGS 201.10.0, 201.11.0
3. FOR DESCRIPTION, MATERIALS, AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.
4. THIS DROP INLET IS NOT TO BE USED AT ANY LOCATION WHERE IT MAY PRESENT A HAZARD TO VEHICLES THAT RUN OFF THE ROAD FOR FLUSH TYPE SEE DRAWING 203.4.0
5. SEE DRAWING 201.3.0 CONCRETE BLOCK CATCH BASIN FOR DETAILS

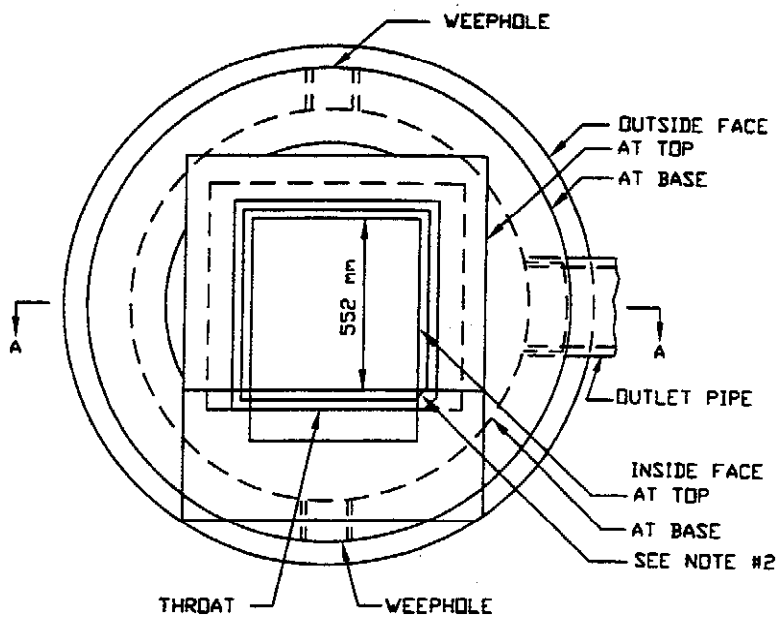
MASS HIGHWAY CONSTRUCTION STANDARDS

DROP INLET

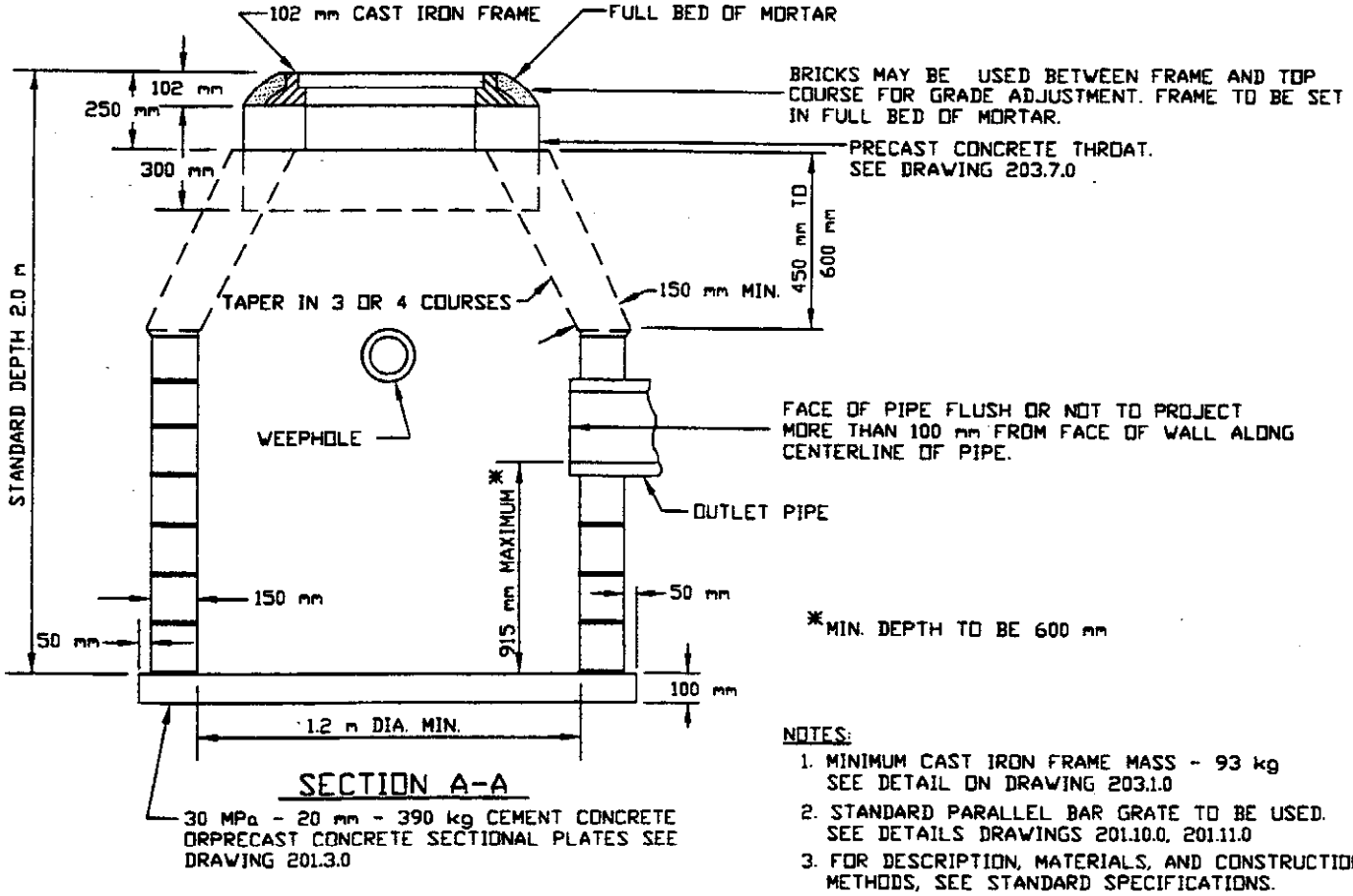
TYPE - C

DATE OF ISSUE 9/22/95

DRAWING NUMBER 203.3.0



PLAN



SECTION A-A

*MIN. DEPTH TO BE 600 mm

NOTES:

1. MINIMUM CAST IRON FRAME MASS - 93 kg SEE DETAIL ON DRAWING 203.1.0
2. STANDARD PARALLEL BAR GRATE TO BE USED. SEE DETAILS DRAWINGS 201.10.0, 201.11.0
3. FOR DESCRIPTION, MATERIALS, AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.
4. TO BE USED IN MEDIANS AND DITCHES THAT ARE WITHIN THE RECOVERY AREA.
5. SEE DRAWING 201.3.0 CONCRETE BLOCK CATCH BASIN FOR DETAILS

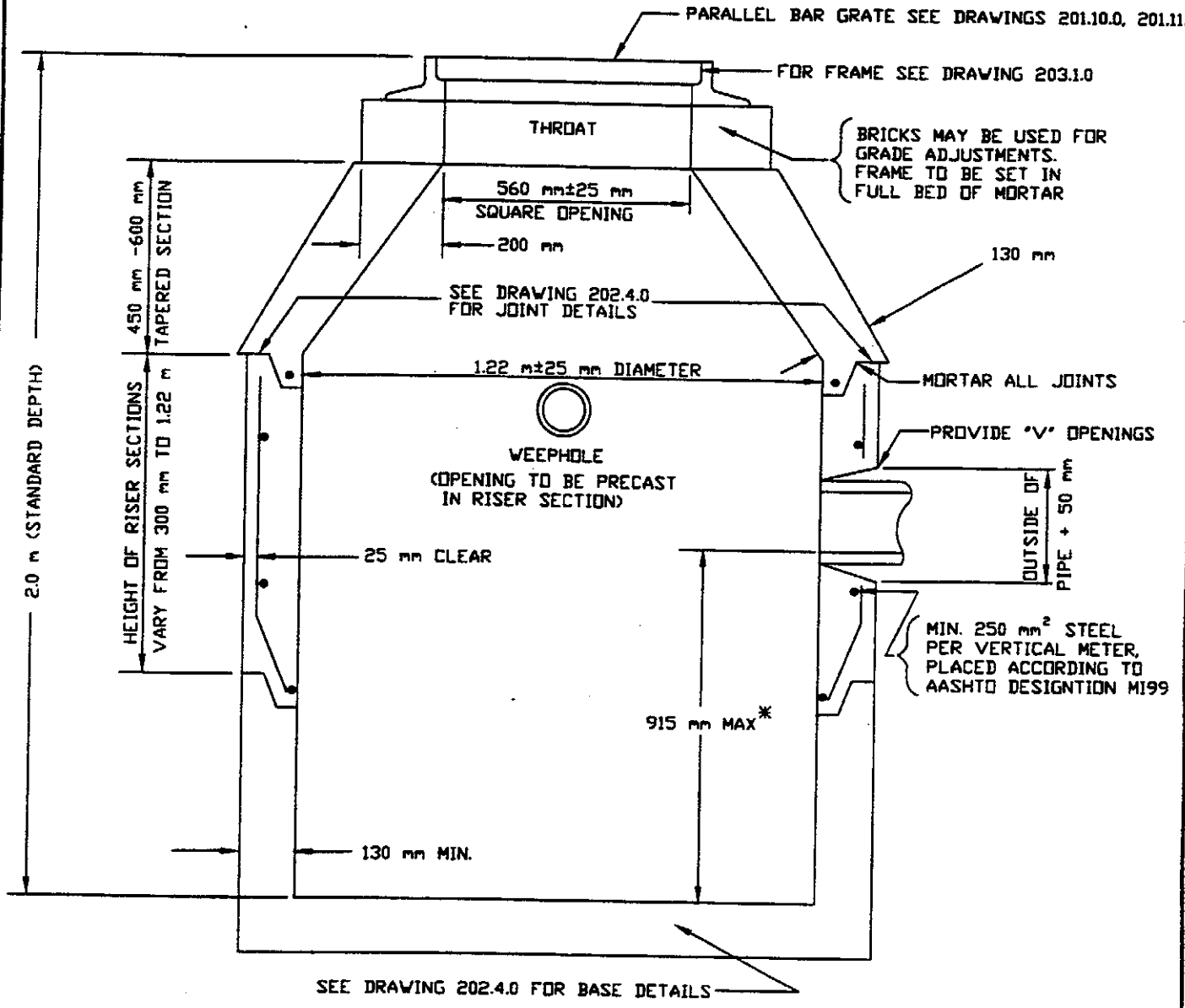
MASS HIGHWAY CONSTRUCTION STANDARDS

DROP INLET

TYPE - CF

DATE OF ISSUE 9/22/95

DRAWING NUMBER **203.4.0**



* MINIMUM DEPTH OF SUMP TO BE 600 mm

NOTES:

1. DETAILS NOT INDICATED ABOVE ARE TO BE SIMILAR TO THOSE SHOWN ON DRAWING 203.3.0
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHOD, SEE LATEST STANDARD SPECIFICATIONS
3. THIS DROP INLET IS NOT TO BE USED AT ANY LOCATION WHERE IT MAY PRESENT A HAZARD TO VEHICLES THAT RUN OFF THE ROAD. FOR FLUSH TYPE SEE DRAWING 203.6.0

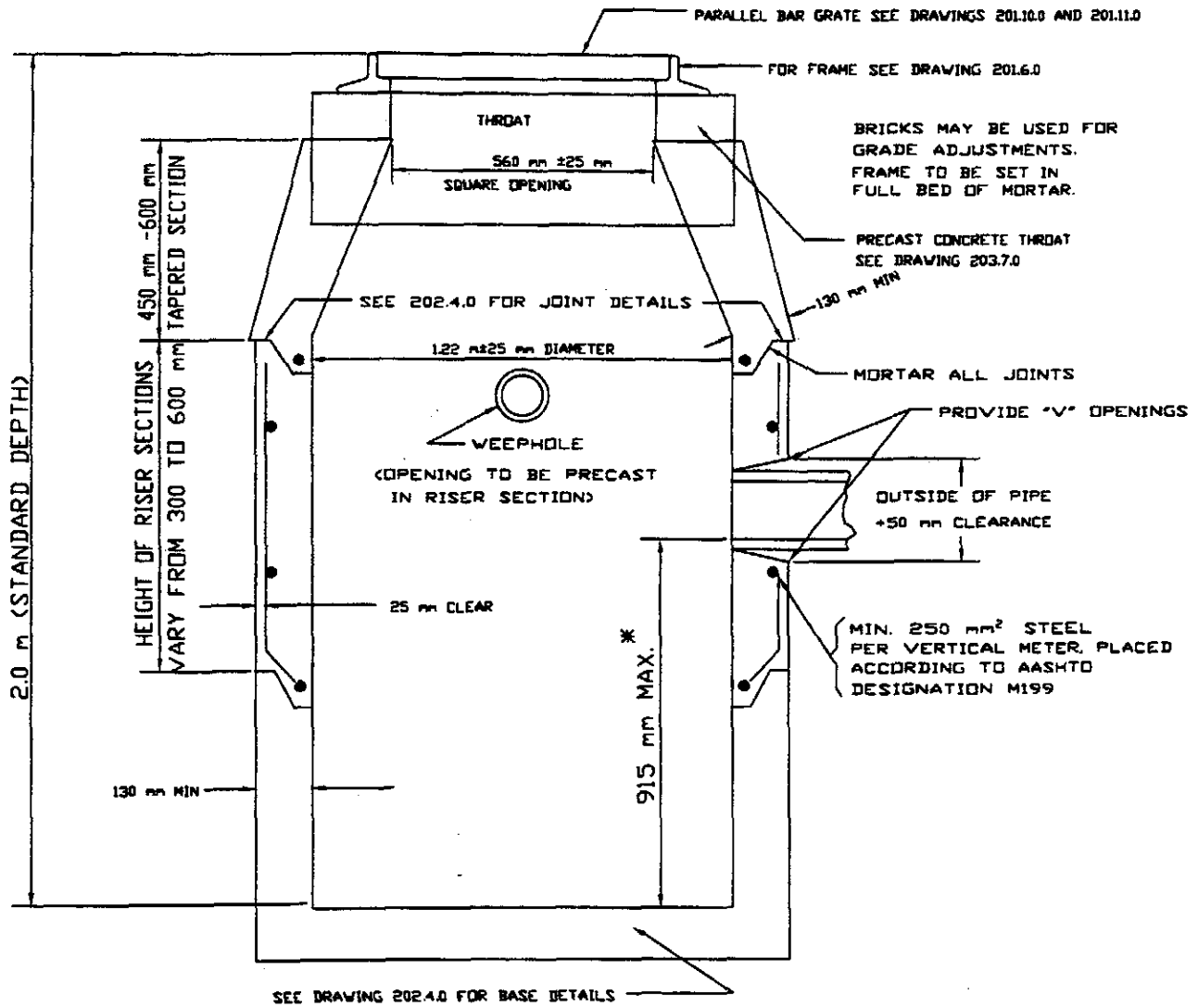
MASS HIGHWAY CONSTRUCTION STANDARDS

PRECAST CONCRETE DROP INLET

TYPE – D

DATE OF ISSUE 9/22/95

DRAWING NUMBER **203.5.0**



* MINIMUM DEPTH OF SUMP TO BE 600 mm

NOTES:

1. DETAILS NOT INDICATED ABOVE ARE TO BE SIMILAR TO THOSE SHOWN ON DRAWINGS 203.3.0 AND 203.4.0
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHOD, SEE LATEST STANDARD SPEFICATIONS
3. TO BE USED IN MEDIANS AND DITCHES THAT ARE WITHIN THE RECOVERY AREA

MASS HIGHWAY CONSTRUCTION STANDARDS

PRECAST CONCRETE DROP INLET

TYPE DF

DATE OF ISSUE 9/22/95

DRAWING NUMBER **203.6.0**

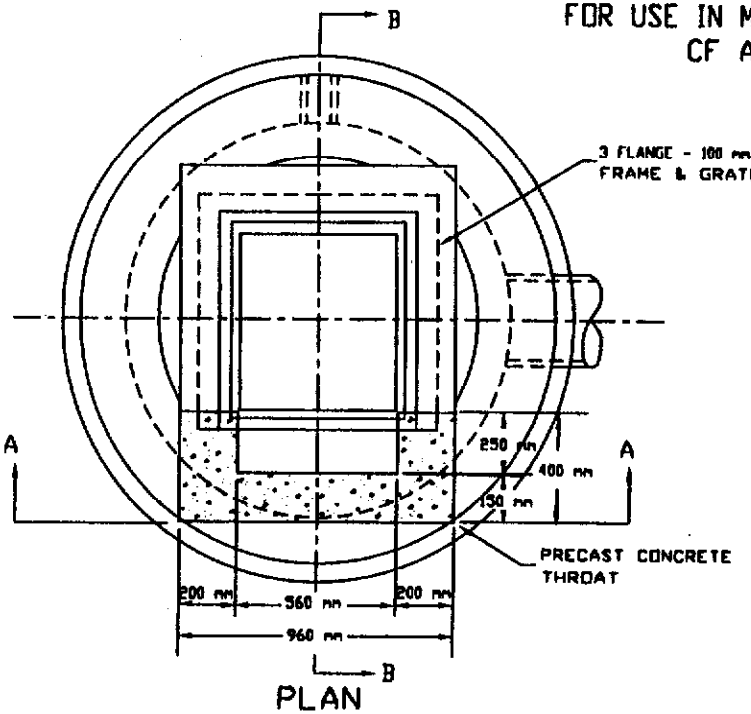
MASS HIGHWAY CONSTRUCTION STANDARDS

FLUSH DROP INLET THROAT

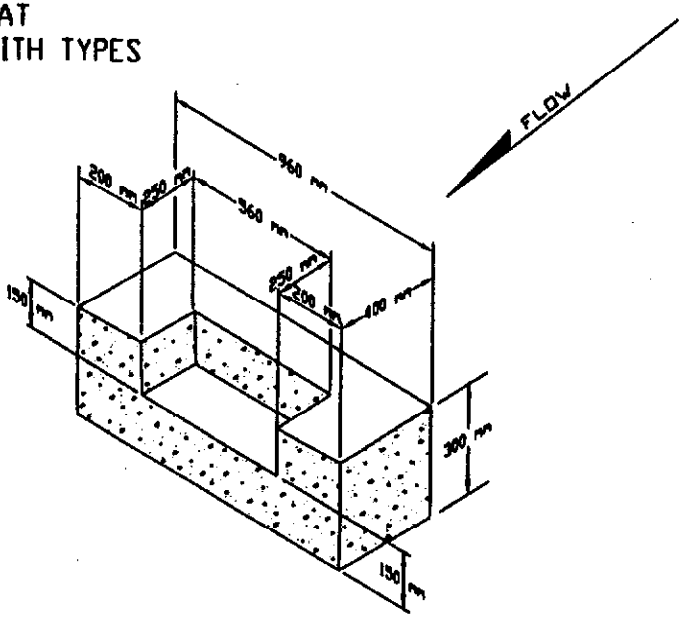
DRAWING NUMBER 203.7.0

DATE OF ISSUE 9/22/95

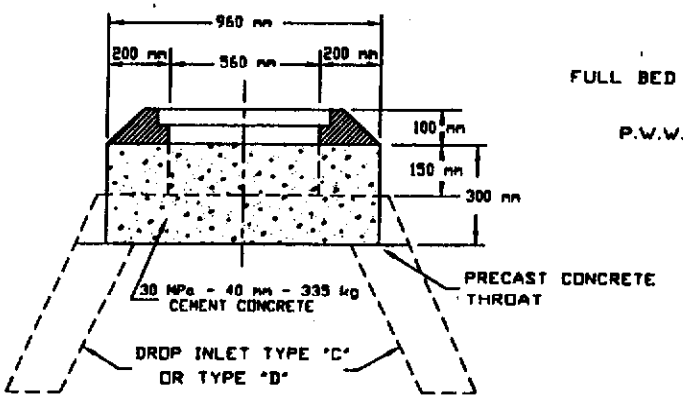
PRECAST CONCRETE THROAT FOR USE IN MEDIANS & DITCHES WITH TYPES CF AND DF DROP INLETS



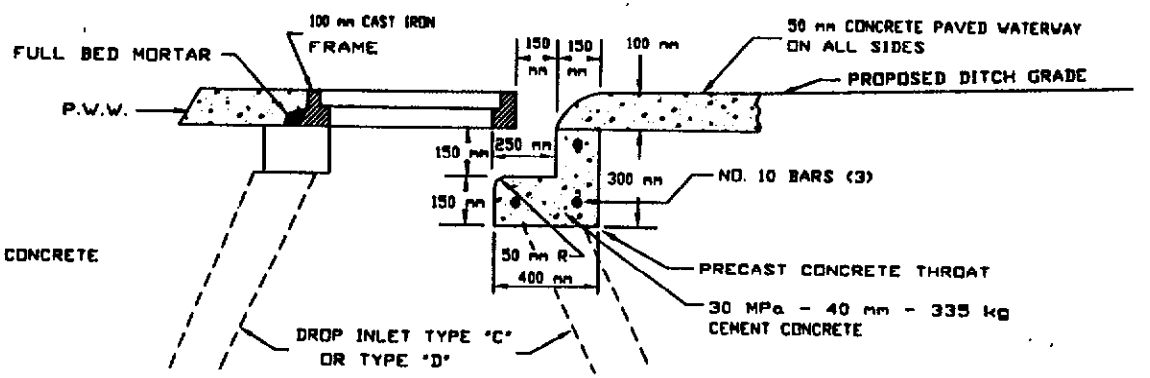
PLAN



ISOMETRIC OF PRECAST CONCRETE THROAT OPENING



SECTION A-A



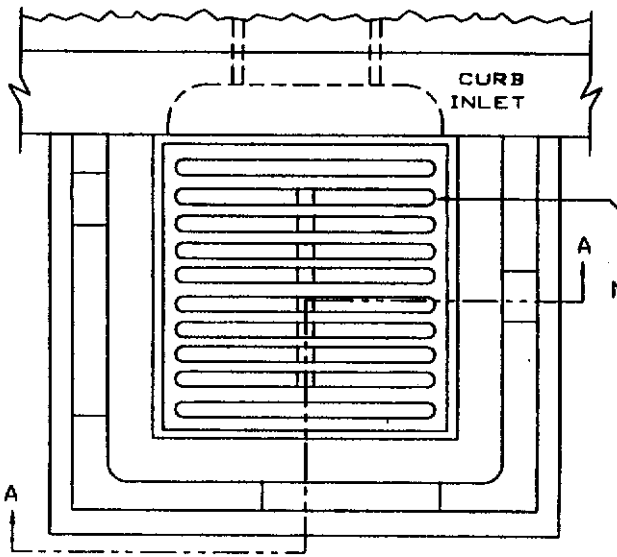
SECTION B-B

MASS HIGHWAY
CONSTRUCTION STANDARDS

CONCRETE BLOCK GUTTER INLET

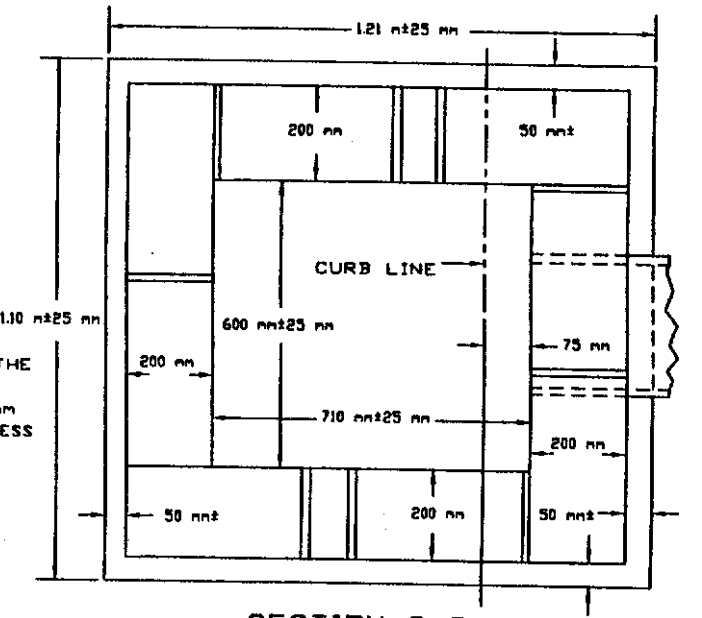
DATE OF ISSUE 9/22/95

DRAWING NUMBER 204.2.0

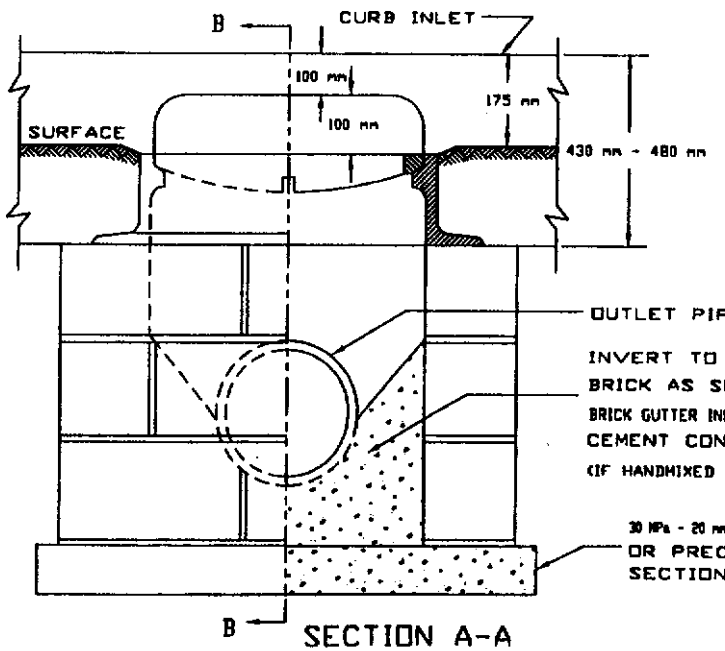


NOTES:

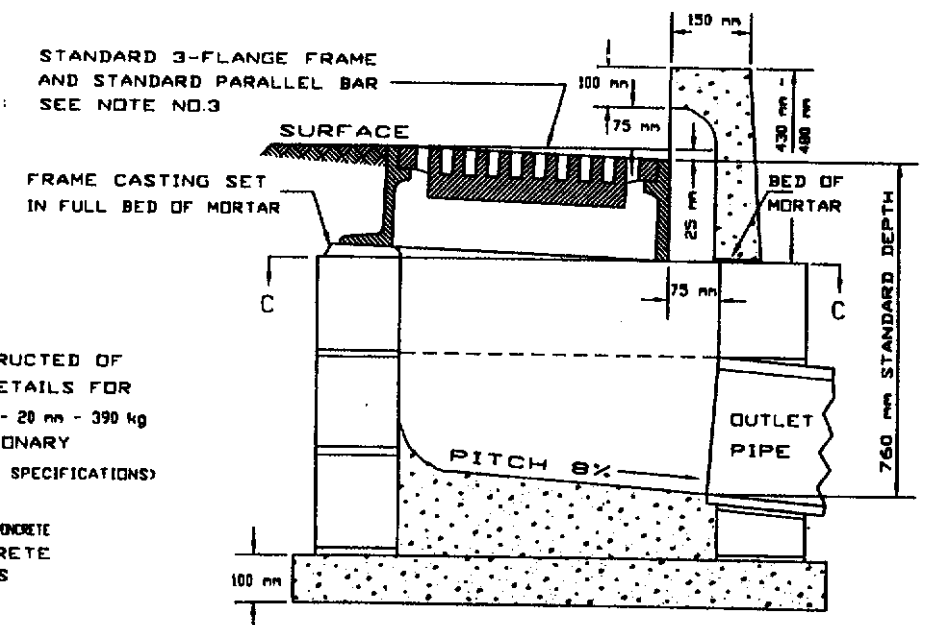
1. WHERE CURB INLET IS NOT USED THE INSIDE HORIZONTAL DIMENSIONS OF GUTTER INLET TO BE 600 mm±25 mm X 600 mm±25 mm IN WHICH CASE AND UNLESS OTHERVIZE DIRECTED, A STANDARD 4-FLANGE FRAME IS TO BE USED.
2. BRICKS MAY BE USED BETWEEN TOP COURSE AND FRAME FOR GRADE ADJUSTMENT.
3. A CASCADE GRATE IS TO BE USED WHERE BICYCLE TRAVEL IS ALLOWED.
4. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.



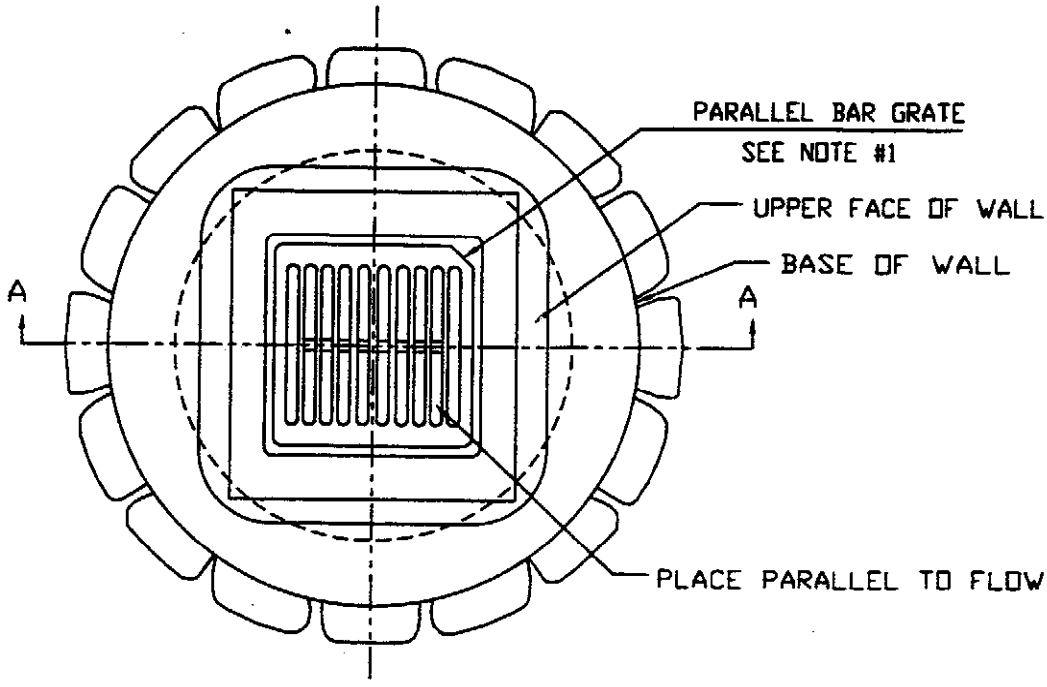
SECTION C-C



SECTION A-A

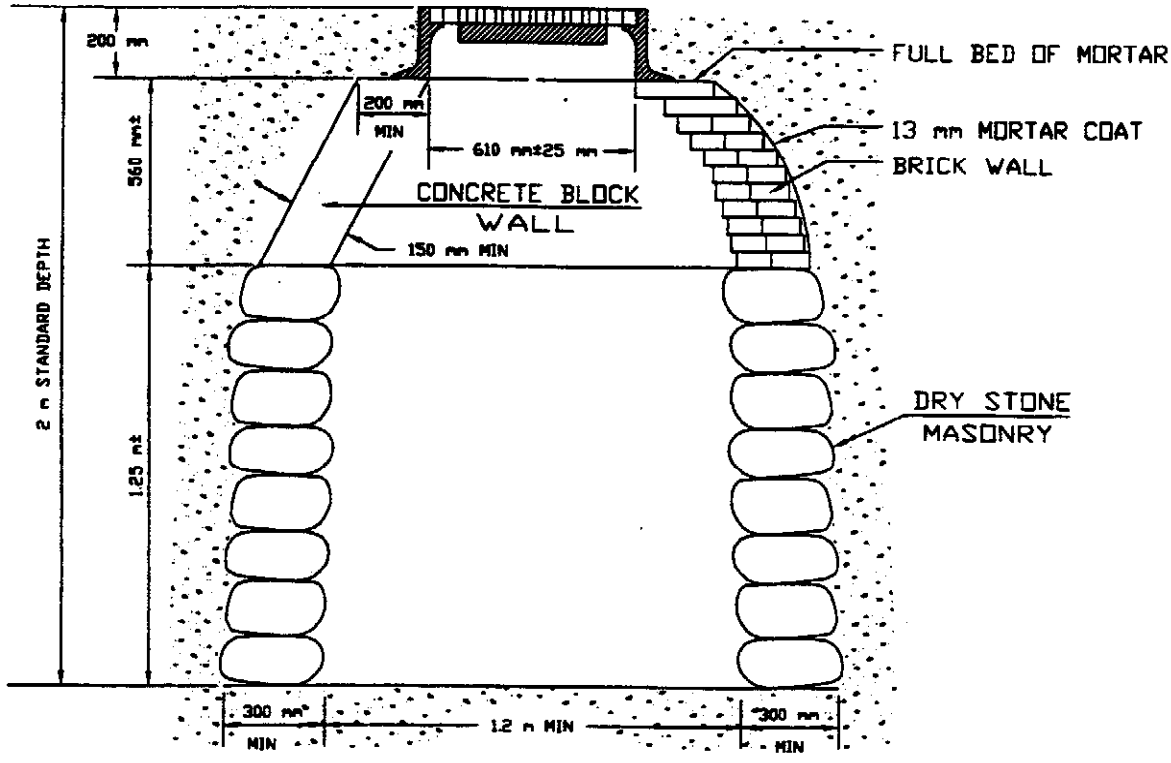


SECTION B-B



NOTES:

1. USE CASCADE GRATE WHERE BICYCLE TRAVEL IS LEGALLY ALLOWED. SEE DRAWINGS 201.7.0 - 201.9.0
2. BRICK WALL TO BE 200 mm THICK; EVERY FIFTH COURSE TO BE HEADERS; OUTSIDE TO BE FINISHED WITH CEMENT MORTAR COATING.
3. WHEN USING CONCRETE BLOCKS, BLOCKS TO BE SET IN FULL BED OF MORTAR AND TAPERED IN 3 OR 4 COURSES.
4. BACKFILL FOR FULL DEPTH OF BASIN EXCAVATION TO BE GRAVEL.
5. FOR DESCRIPTION, MATERIALS AND METHOD OF CONSTRUCTION SEE STANDARD SPECIFICATIONS.



SECTION A-A

MASS HIGHWAY CONSTRUCTION STANDARDS

DRY STONE MASONRY LEACHING BASIN

DATE OF ISSUE 9/22/95

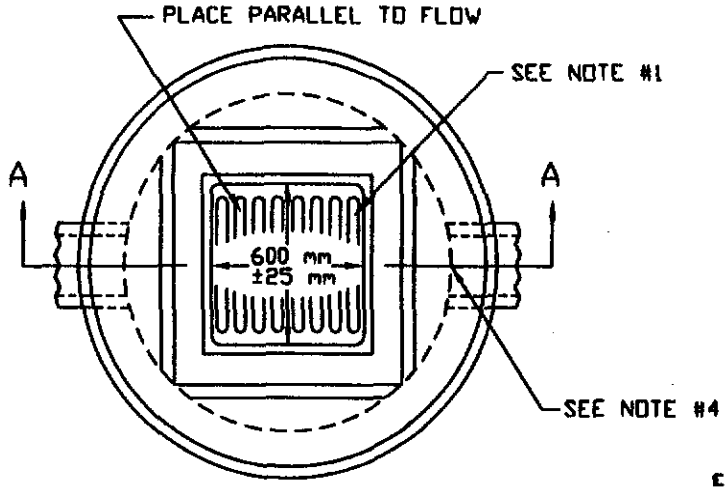
DRAWING NUMBER **205.1.0**

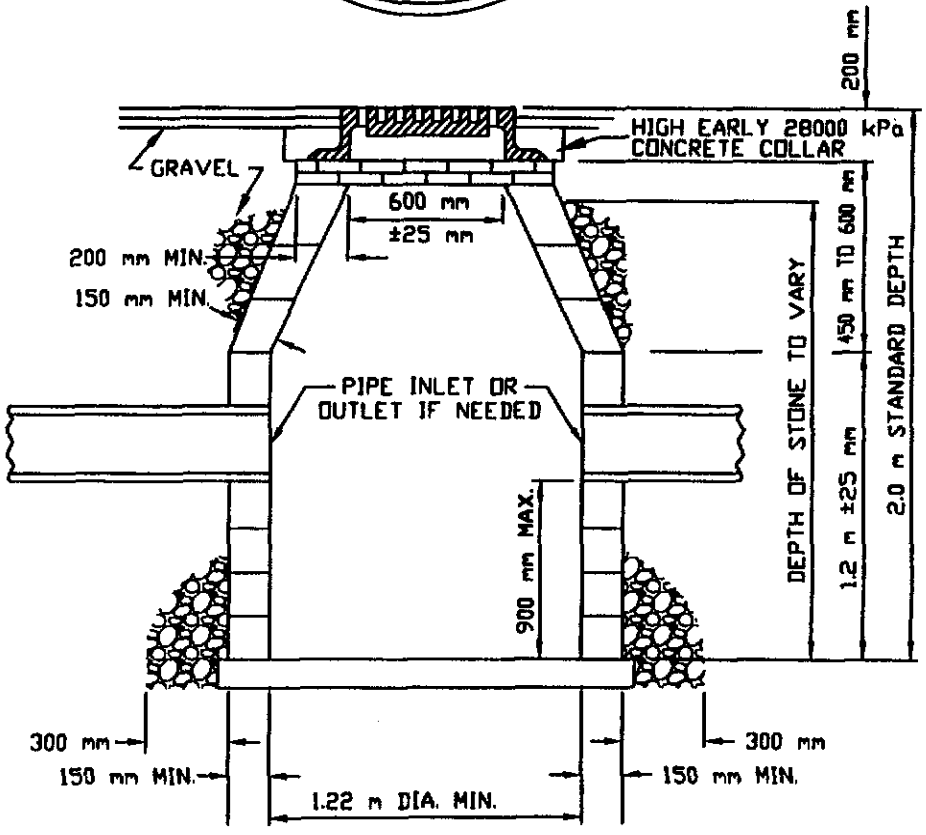
MASS HIGHWAY
CONSTRUCTION STANDARDS

CONCRETE BLOCK LEACHING BASIN

DRAWING NUMBER
205.2.0

DATE OF ISSUE
9/22/95



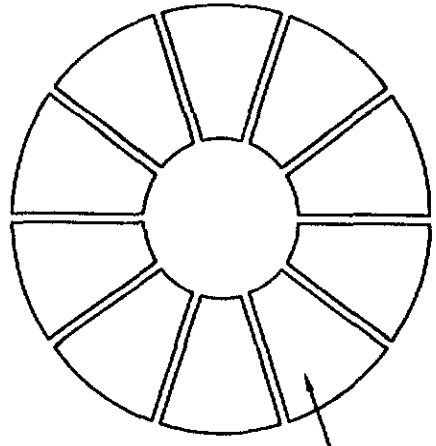


SECTION A-A

NOTES:

1. USE CASCADE GRATE WHERE BICYCLE TRAVEL IS LEGALLY ALLOWED. SEE DRAWINGS 201.7.0 - 201.9.0.
2. BACKFILL FOR FULL DEPTH OF BASIN EXCAVATION TO BE 13 mm CRUSHED STONE.
3. FOR DESCRIPTION, MATERIALS, AND METHOD OF CONSTRUCTION SEE STANDARD SPECIFICATIONS.
4. FACE OF PIPE FLUSH OR NOT TO PROJECT MORE THAN 100 mm FROM FACE OF WALL ALONG CENTERLINE OF PIPE.
5. THE LEACHING BASIN SHALL BE CONSTRUCTED OF CEMENT CONCRETE BLOCKS TO CONFORM TO THE REQUIREMENTS OF STANDARD SPECIFICATION SUBSECTION M4.05.1.

PLAN OF BASE



BOTTOM PLATES REQUIRE
10 PIECES PER CIRCLE WITH
13 mm SPACING BETWEEN PLATES.

MASS HIGHWAY CONSTRUCTION STANDARDS

ASPHALT COATED CORRUGATED STEEL METAL PIPE

TABLE OF MINIMUM WALL THICKNESS (mm)

DRAWING NUMBER 206.1.0

DATE OF ISSUE 9/22/95

TABLE OF MINIMUM WALL THICKNESS (mm)
(68 mm x 13 mm CORRUGATION)

DIA. (mm) OR (m)	HEIGHT OF COVER ABOVE TOP OF PIPE (m)										
	0.45-3.00	3.25-4.50	4.75-6.00	6.25-7.50	7.75-9.00	9.25-10.50	10.75-12.00	12.25-13.50	13.75-15.00	15.25-16.50	16.75-18.00
381 mm	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6			
457 mm	1.6	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0		
533 mm	1.6	1.6	1.6	1.6	1.6	1.6	2.0	2.0	2.0	2.7	
610 mm	1.6	1.6	1.6	2.0	2.0	2.0	2.0	2.7	2.7	3.5	3.5
762 mm	2.0	2.0	2.0	2.0	2.7	2.7	2.7	3.5	3.5	3.5	4.2
914 mm	2.0	2.0	2.7	2.7	3.5	3.5	3.5	3.5	4.2	4.2	4.2
1.07 m	2.7	2.7	2.7	3.5	3.5	3.5	4.2	4.2	4.2	4.2	4.2
1.22 m	2.7	2.7	2.7	3.5	4.2	4.2	3.5	3.5	3.5	4.2	4.2
1.37 m	3.5	3.5	4.2	4.2	3.5	3.5	3.5	4.2	4.2		
1.52 m	4.2	3.5	3.5	3.5	4.2	4.2	4.2	4.2			
1.68 m	3.5	3.5	3.5	4.2	4.2	4.2	4.2				
1.83 m	4.2	4.2	4.2	4.2	4.2						

NOTES:

1. ALL PIPE BELOW SOLID LINE TO BE SHOP STRUTTED AS PER STATE SPECIFICATIONS
2. MINIMUM COVER IS TOP OF PIPE TO ROAD - 450 mm GRADE

MASS HIGHWAY CONSTRUCTION STANDARDS

TABLE OF MINIMUM WALL THICKNESS (mm)

MADE FROM PIPE OF DIA. (mm) OR (m)	SPAN (mm) OR (m)	RISE (mm) OR (m)	HEIGHT OF COVER ABOVE TOP OF PIPE ARCH (m)			
			0.45-1.00	1.25-1.50	1.75-3.00	3.25-4.50
381 mm	457 mm	279 mm	1.6	1.6	1.6	1.6
457 mm	559 mm	330 mm	1.6	1.6	1.6	1.6
610 mm	737 mm	457 mm	2.0	2.0	2.0	2.0
762 mm	914 mm	559 mm	2.0	2.0	2.0	2.0
914 mm	1.09 m	686 mm	2.7	2.7	2.7	2.7
1.07 m	1.27 m	787 mm	2.7	2.7	2.7	2.7
1.22 m	1.47 m	914 mm	3.5	2.7	2.7	3.5
1.37 m	1.65 m	1.02 m	3.5	3.5	3.5	4.2
1.52 m	1.83 m	1.12 m	4.2	4.2	4.2	

NOTES:

1. MINIMUM COVER IS TOP OF PIPE TO ROAD GRADE - 450 mm
2. FOR HEAVIER FILLS USE STRUCTURAL PLATE

ASPHALT COATED CORRUGATED STEEL METAL PIPE ARCH

TABLE OF MINIMUM WALL THICKNESS (mm)

DATE OF ISSUE 9/22/95

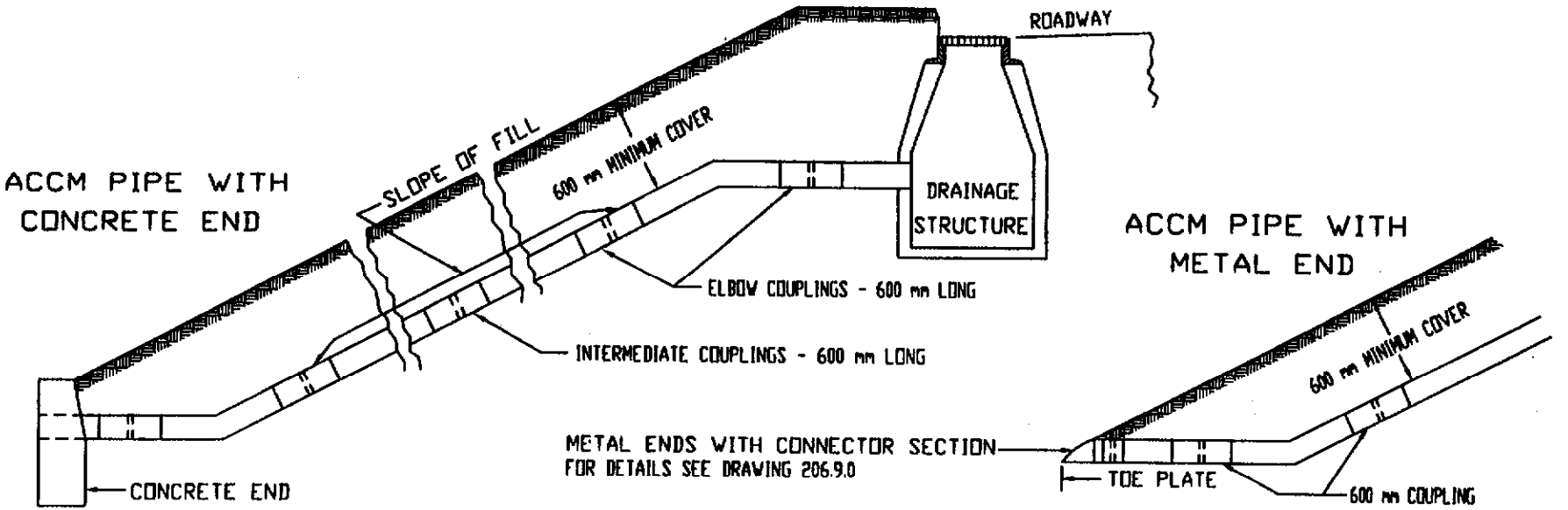
DRAWING NUMBER 206.2.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

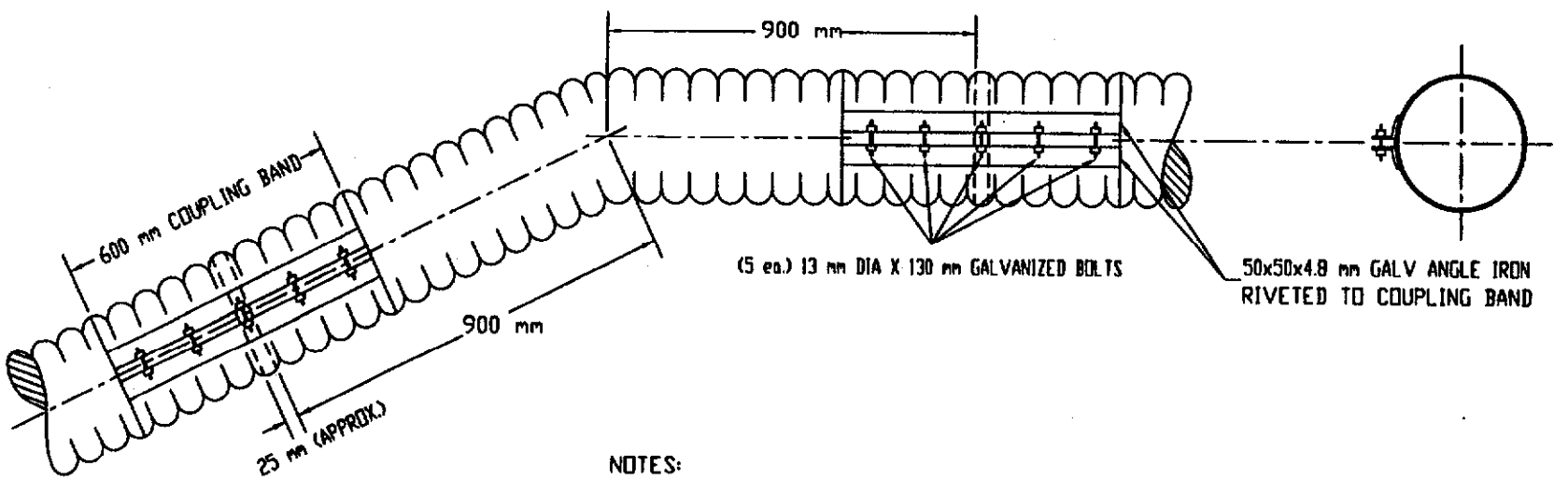
ACCM PIPE UNDER FILL SLOPES

DATE OF ISSUE 9/22/95

DRAWING NUMBER **206.3.0**

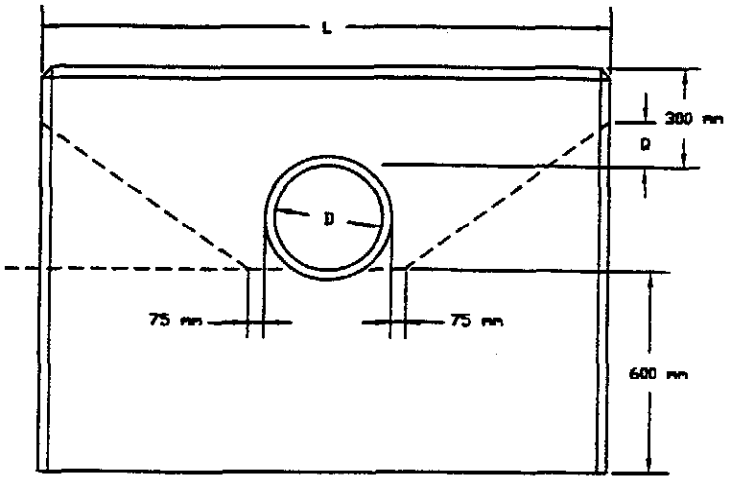


ELBOW AND COUPLING DETAILS

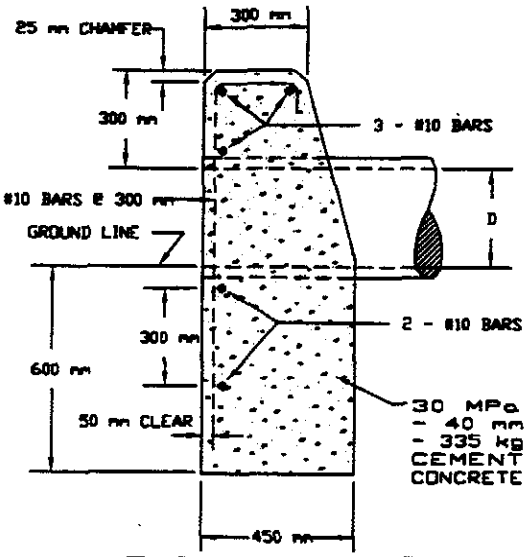


NOTES:

1. A TOE PLATE IS REQUIRED FOR ALL METAL ENDS.
2. ALL METAL END UNITS AND ELBOWS TO BE SHOP FABRICATED.



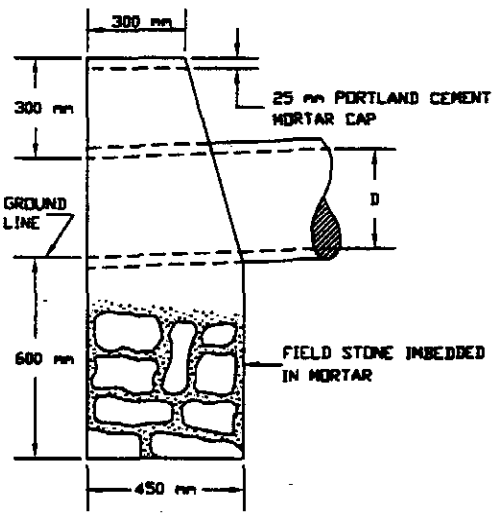
FRONT ELEVATION



END ELEVATION

PIPE DIAM.	1V : 1.5H SLOPE			TRENCH EXCAV. 300 mm DEPTH	1V : 2H SLOPE			TRENCH EXCAV. 300 mm DEPTH
D mm	L m	CONC. OR F.S.M. m^3	STEEL kg	m^3	L m	CONC. OR F.S.M. m^3	STEEL kg	m^3
200	1.25	0.56	6.00	0.58	1.75	0.79	9.00	0.74
250	1.45	0.67	8.00	0.65	2.00	0.93	10.00	0.82
300	1.65	0.79	8.00	0.71	2.25	1.08	12.00	0.90
375	1.95	0.97	10.00	0.80	2.63	1.33	14.00	1.02
450	2.25	1.18	12.00	0.90	3.00	1.59	17.00	1.13
525	2.55	1.39	14.00	0.99	3.38	1.87	20.00	1.25
600	2.85	1.62	17.00	1.09	3.75	2.17	22.00	1.37
750	3.45	2.11	21.00	1.28	4.50	2.81	29.00	1.61

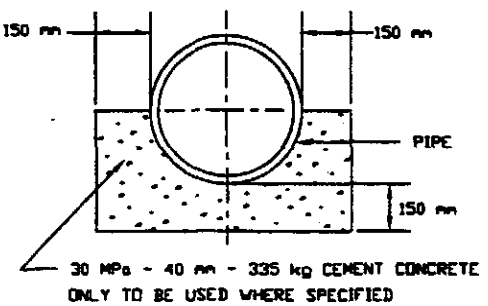
Q	
	100 mm FOR 1V : 1.5H SLOPE
	150 mm FOR 1V : 2H SLOPE



END ELEVATION

NOTES:

1. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE LATEST STANDARD SPECIFICATIONS.
2. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.
3. PAYMENTS WILL BE BASED ON THE ACCOMPANYING TABLE.



CONCRETE CRADLE FOR PIPE CULVERTS

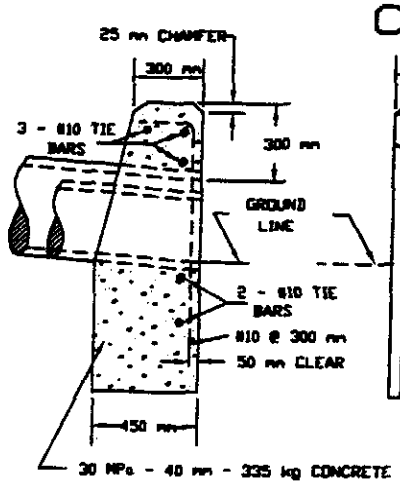
MASS HIGHWAY
CONSTRUCTION
STANDARDS

CONCRETE AND FIELD STONE MASONRY ENDS FOR 200 mm TO 750 mm PIPE CULVERT

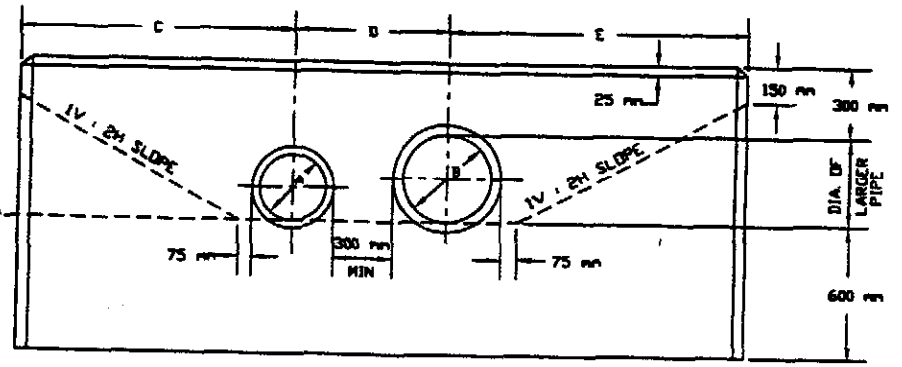
DATE OF ISSUE
9/22/95

DRAWING NUMBER
206.4.0

CONCRETE ENDS

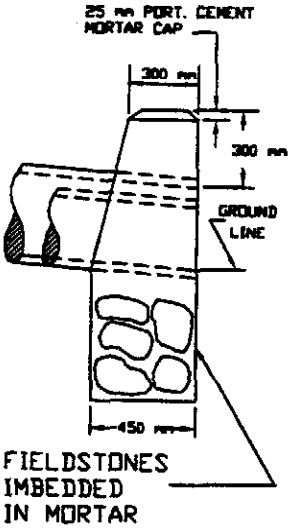


END ELEVATION



FRONT ELEVATION

FIELD STONE MASONRY ENDS



END ELEVATION

DESIGN NO.	DIAMETER (mm)		LENGTHS (mm)			MASONRY m	STEEL kg	TRENCH EXCAV. 300 mm DEPTH m
	A	B	C	D	E			
1	300	300	1125	700	1125	1.43	16.78	1.16
2	300	375	1280	740	1310	1.71	19.05	1.29
3	300	450	1430	790	1500	2.01	21.77	1.41
4	300	525	1580	830	1690	2.33	24.49	0.99
5	300	610	1730	880	1880	2.68	26.76	1.67
6	300	750	2030	950	2250	3.40	32.21	1.91
7	375	375	1310	790	1310	1.73	18.60	1.32
8	375	450	1460	830	1500	2.04	21.77	1.45
9	375	525	1610	870	1690	2.36	24.49	1.58
10	375	610	1760	920	1880	2.71	27.22	1.70
11	375	750	2060	990	2250	3.43	32.66	1.94
12	450	450	1500	870	1500	2.06	21.77	1.45
13	450	525	1650	920	1690	2.39	23.59	1.59
14	450	610	1800	960	1880	2.74	27.22	1.71
15	450	750	2100	1040	2250	3.46	32.66	1.95
16	525	525	1690	960	1690	2.42	24.04	1.62
17	525	610	1840	1010	1880	2.77	27.67	1.76
18	525	750	2140	1080	2250	3.49	33.11	2.00
19	600	600	1880	1050	1880	2.79	27.67	1.77
20	600	750	2180	1130	2250	3.52	33.57	1.83
21	750	750	2250	1200	2250	3.58	34.02	2.08

NOTE:

1. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.
2. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.
3. PAYMENTS WILL BE BASED ON THE QUANTITIES SHOWN IN ACCOMPANYING TABLE.

MASS HIGHWAY CONSTRUCTION STANDARDS

CONCRETE AND FIELDSTONE MASONRY COMBINATION ENDS FOR PIPES UP TO 750 mm

DATE OF ISSUE 9/22/95

DRAWING NUMBER **206.5.0**

MASS HIGHWAY
CONSTRUCTION STANDARDS

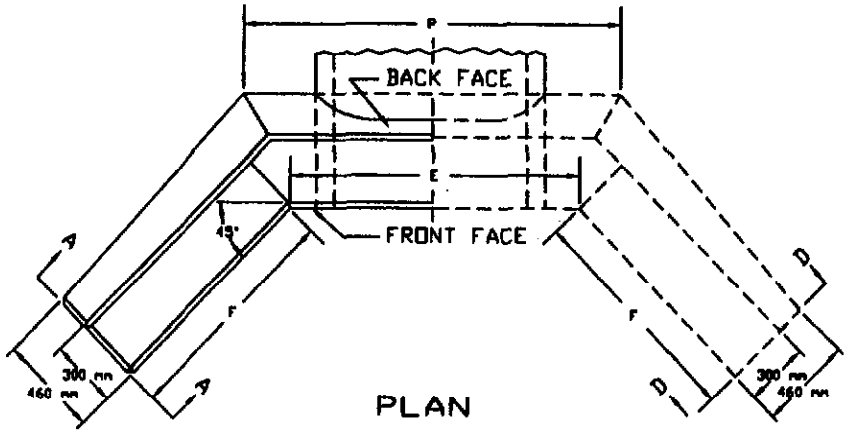
CONCRETE AND FIELD STONE MASONRY ENDS

FOR 750 mm TO 2.1 m PIPE CULVERTS

DRAWING NUMBER **206.6.0**

DATE OF ISSUE 9/22/95

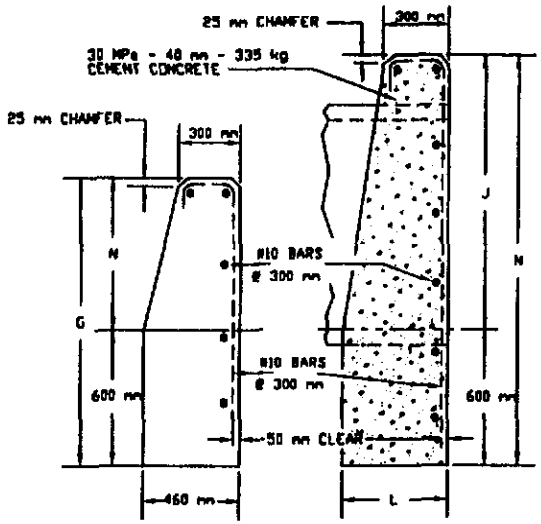
NOTE:
1. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE STANDARD SPECIFICATIONS.
2. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.
3. PAYMENTS WILL BE BASED ON THE QUANTITIES SHOWN IN THE ACCOMPANYING TABLE.



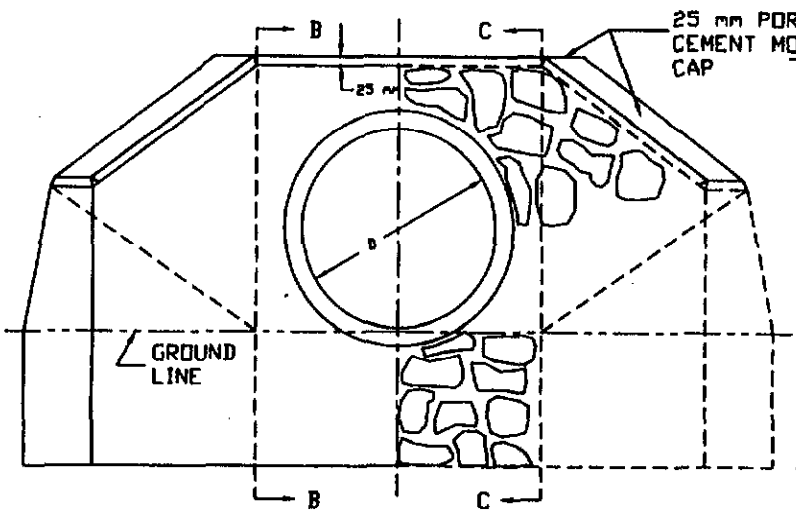
PLAN

1V:1.5H AND 1V:2H SLOPES								1V:1.5H SLOPE			1V:2H SLOPE			TRENCH EXCAV. FOR 1:2 SLOPE FOR 305mm DEPTH m
D	E	G	H	J	L	N	P	F	CONC. MASONRY m^3	STEEL kg	F	CONC. MASONRY m^3	STEEL kg	
750	1.22	1.20	1.67	1.07	460	600	1.60	910	2.0	20.4	1.30	2.4	24.5	1.60
900	1.37	1.29	1.82	1.22	510	690	1.80	1.07	2.6	24.5	2.27	3.2	29.0	1.80
1.05	1.52	1.36	1.97	1.37	560	760	1.98	1.22	3.2	26.8	2.61	4.0	31.8	2.10
1.20	1.68	1.44	2.12	1.52	610	840	2.18	1.37	4.0	29.5	2.95	5.0	37.7	2.40
1.35	1.83	1.51	2.28	1.68	660	910	2.39	1.52	4.8	33.1	3.29	6.0	42.2	2.70
1.50	1.98	1.59	2.43	1.83	710	990	2.57	1.68	5.7	38.6	3.63	7.2	48.1	3.00
1.80	2.29	1.74	2.73	2.13	810	1.14	2.97	1.98	7.8	44.5	4.31	10.0	58.1	3.70
2.10	2.59	1.90	3.04	2.44	910	1.30	3.35	2.29	10.3	54.4	5.00	13.2	70.0	4.40

CONCRETE ENDS

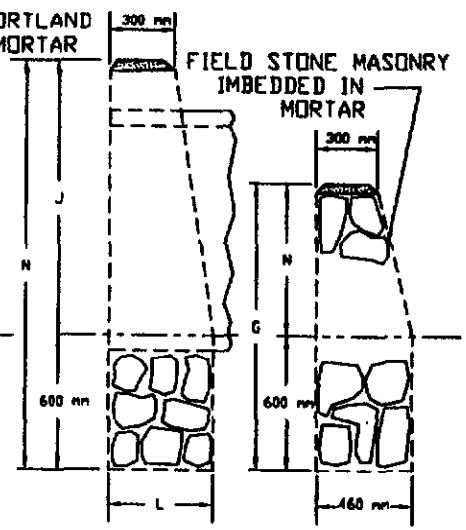


ELEV. A-A SECTION B-B



FRONT ELEVATION

FIELD STONE MASONRY ENDS

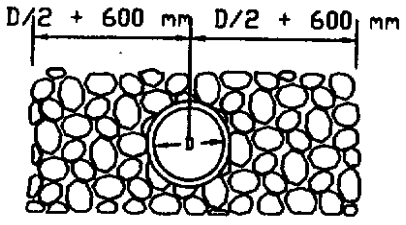


SECTION C-C ELEV. D-D

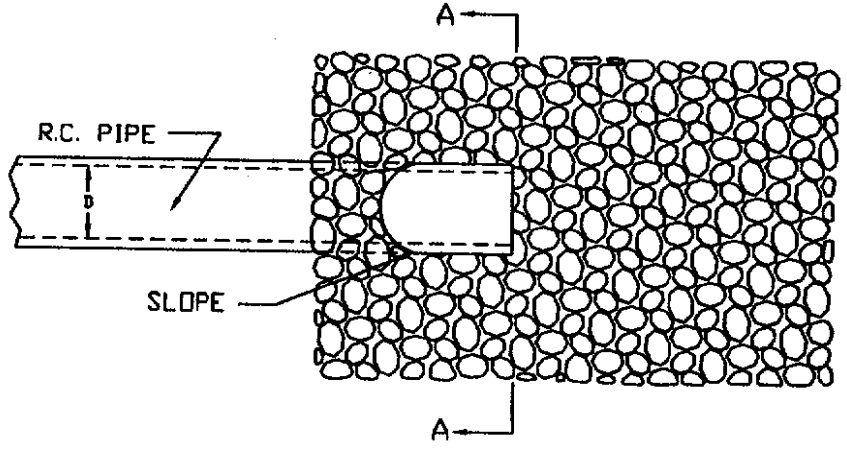
MASS HIGHWAY CONSTRUCTION STANDARDS

STONE PIPE ENDS

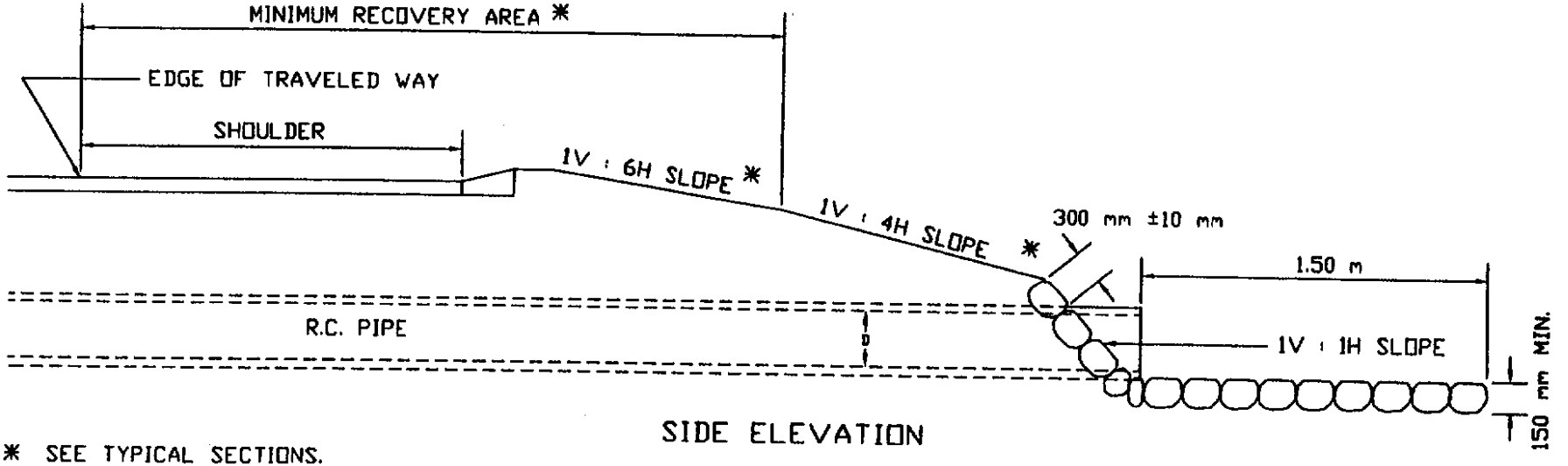
FOR PIPES 600 mm AND LESS IN DIA.



SECTION A-A



PLAN



SIDE ELEVATION

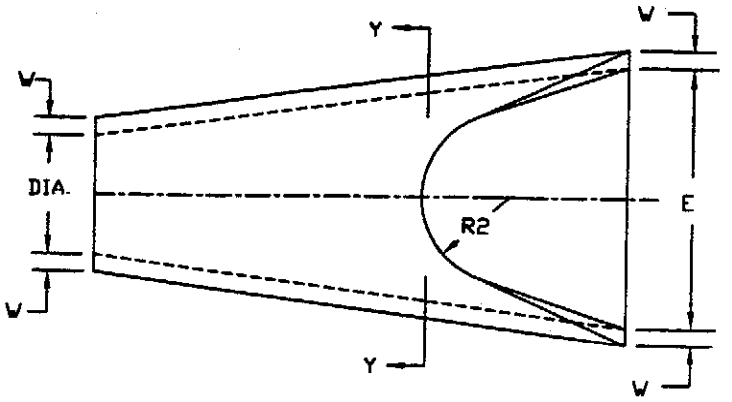
* SEE TYPICAL SECTIONS.

NOTES:

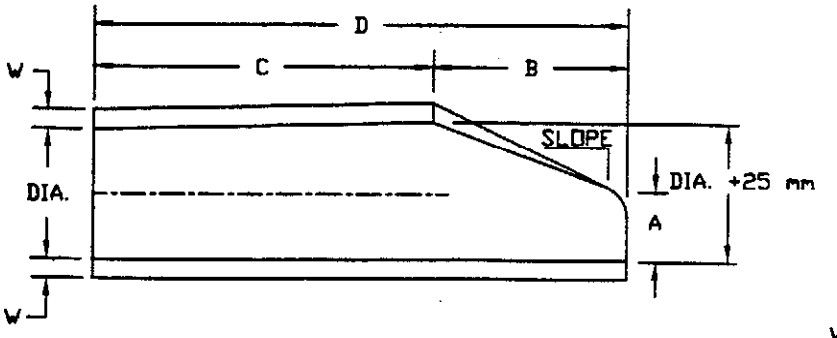
1. STONE TREATMENT OF PIPE ENDS SHALL NOT BE USED IN THE VEHICLE RECOVERY AREA.
2. MINIMUM MASS PER STONE = 25 kg; MAXIMUM MASS PER STONE = 60 kg.
3. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

DATE OF ISSUE 9/22/95

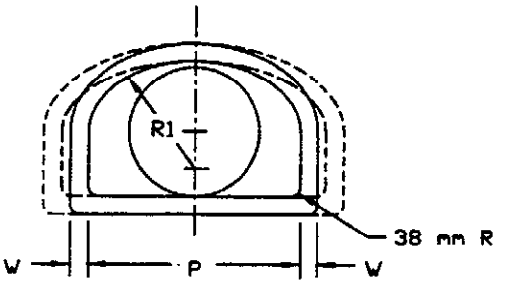
DRAWING NUMBER 206.7.0



PLAN



SECTION



SECTION Y-Y

TABLE
(ALL DIMENSIONS ARE mm OR m)

DIA.	W	A	B	C	D	E	P	DIA. +25 mm	R1	R2	SLOPE
305	51	102	610	1240	1.850	610	506	330	257	229	1V : 3H
381	57	152	686	1170	1.856	762	618	406	318	279	1V : 3H
457	64	229	686	1170	1.856	914	737	482	394	305	1V : 3H
533	70	229	838	965	1.803	1.07	803	558	410	330	1V : 3H
610	76	241	1105	762	1.867	1.22	843	635	427	356	1V : 3H
686	83	267	1219	648	1.867	1.37	914	711	471	368	1V : 3H
762	89	305	1372	502	1.874	1.52	940	787	470	381	1V : 3H
914	102	381	1600	883	2.483	1.83	1214	939	618	508	1V : 3H
1067	114	533	1600	889	2.489	1.98	1368	1092	699	559	1V : 3H
1219	127	610	1829	660	2.489	2.13	1435	1244	724	559	1V : 3H

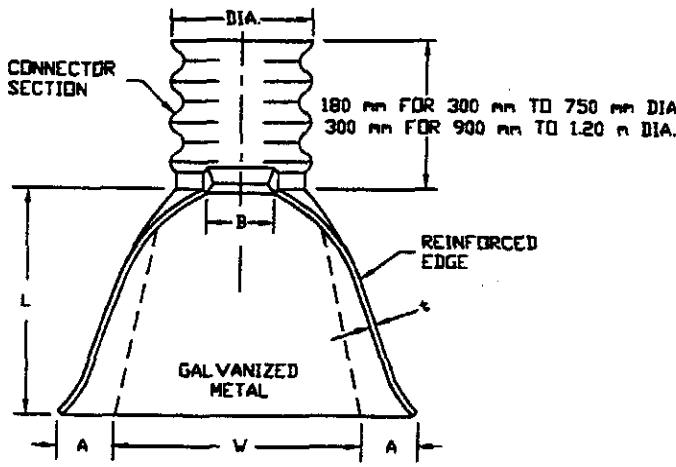
NOTES:
1. SEE STANDARD SPECIFICATIONS FOR THE TYPE OF PIPE TO BE USED (BELL, SPIGOT OR TONGUE & GROOVE)
2. SEE STANDARD SPECIFICATIONS FOR THE TYPE OF PIPE AND PLACING OF STEEL REINFORCEMENT.
3. THE JOINTS ARE TO BE COMPATIBLE WITH THE MAIN RUN OF PIPE.

MASS HIGHWAY
CONSTRUCTION STANDARDS

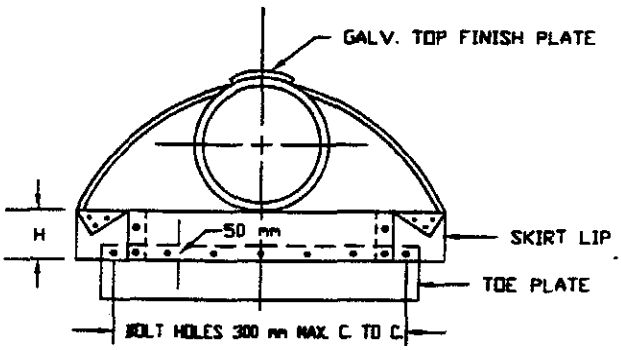
REINFORCED CONCRETE PIPE FLARED ENDS

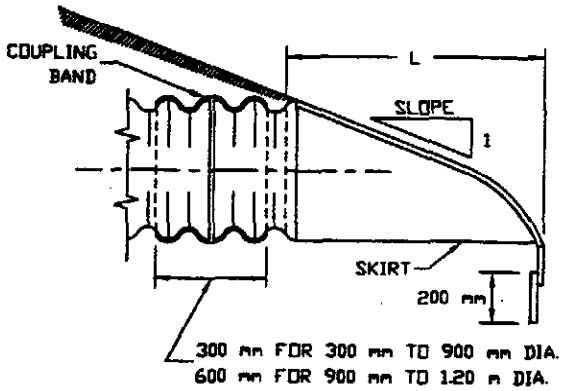
DATE OF ISSUE
9/22/95

DRAWING NUMBER
206.8.0

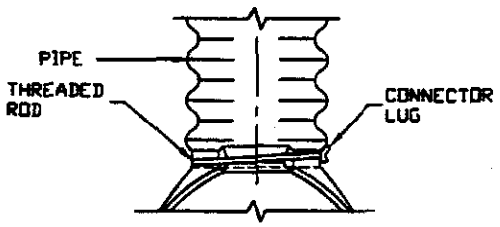


PIPE DIA. (mm OR m)	t mm	DIMENSIONS (mm OR m)						APPROX. SLOPE
		A (±25 mm)	B (MAX.)	H (±25 mm)	L (±38 mm)	W (±51 mm)	X mm	
300	1.6	152	152	152	533	610	180	1V : 2.5H
375	1.6	178	203	152	550	762	180	1V : 2.5H
450	1.6	203	254	152	787	914	180	1V : 2.5H
525	1.6	229	305	152	914	1.07	180	1V : 2.5H
600	1.6	254	330	152	1.04	1.22	180	1V : 2.5H
750	2.0	305	406	203	1.30	1.52	180	1V : 2.5H
900	2.0	356	483	229	1.52	1.83	300	1V : 2.5H
1.05	2.7	406	559	279	1.75	2.13	300	1V : 2.5H
1.20	2.7	457	686	305	1.98	2.29	300	1V : 2.25H

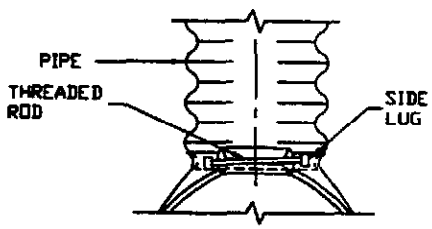




ALTERNATE CONNECTIONS



FOR 300 mm TO 600 mm ONLY



FOR 750 mm AND 900 mm ONLY

NOTES:

1. TOE PLATE TO BE PUNCHED TO MATCH HOLES IN SKIRT LIP. 10 mm ø GALVANIZED BOLTS TO BE FURNISHED. LENGTH OF TOE PLATE TO BE W+250 mm FOR 300 mm TO 750 mm DIA. PIPE AND W+560 mm FOR 900 mm TO 1.20m DIA.
2. SKIRT SECTION FOR 300 mm TO 600 mm DIA. PIPE TO BE MADE IN ONE PIECE. SKIRT SECTION FOR 750 mm TO 1.20 m DIA. PIPE MAY BE MADE FROM TWO SHEETS JOINED BY RIVETING OR BOLTING ON CENTER LINE WITH 10mm DIA. FASTENERS.
3. CONNECTOR SECTION, TOE PLATE AND SKIRT TO BE OF SAME THICKNESS METAL; EACH TO BE GALVANIZED AND COATED WITH A TAR BASE PAINT.
4. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE LATEST STANDARD SPECIFICATIONS.

MASS HIGHWAY CONSTRUCTION STANDARDS

STANDARD METAL END

DATE OF ISSUE 9/22/95

DRAWING NUMBER **206.9.0**

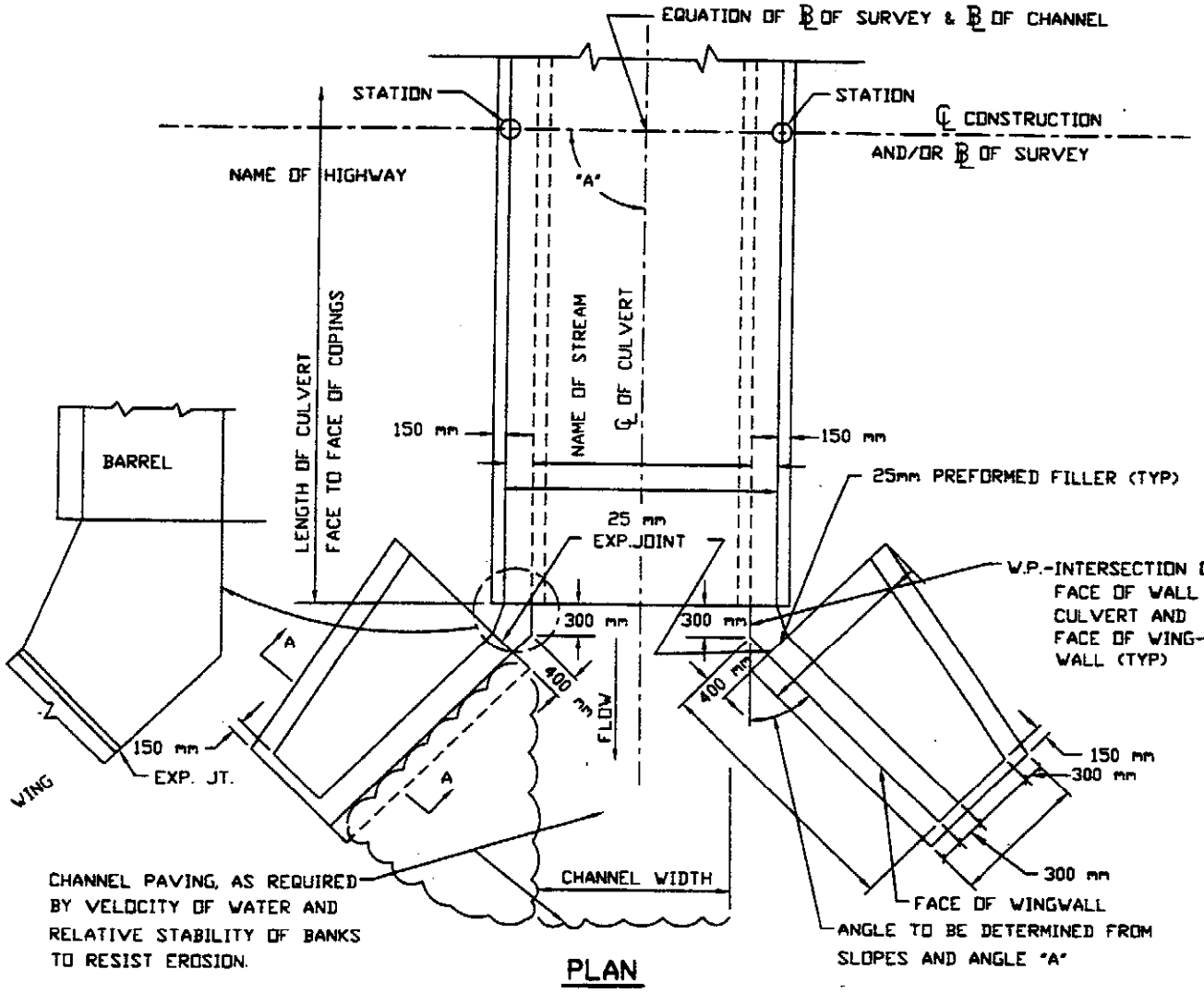
NOTES:

1. PIPE SHALL CONFORM TO THE REQUIREMENTS OF AASHTO DESIGNATION M170 M.

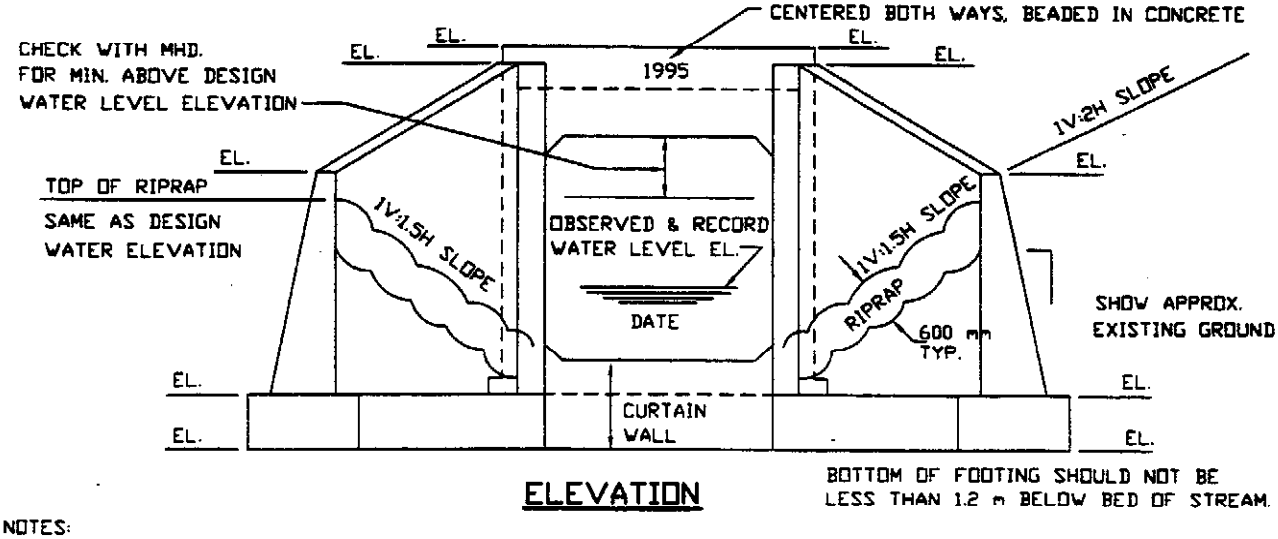
2. PIPE SHALL ALSO CONFORM TO STANDARD SPECIFICATIONS

3. ANY JOINT SYSTEM APPROVED AND ACCEPTED BY AASHTO FOR R.C.C.P. WILL BE ACCEPTABLE.

MASS HIGHWAY CONSTRUCTION STANDARDS	STANDARD JOINT FOR REINFORCED CONCRETE PIPE SIZES 300 mm THROUGH 600 mm	DATE OF ISSUE 9/22/95
		DRAWING NUMBER 206.11.0



PLAN



ELEVATION

NOTES:

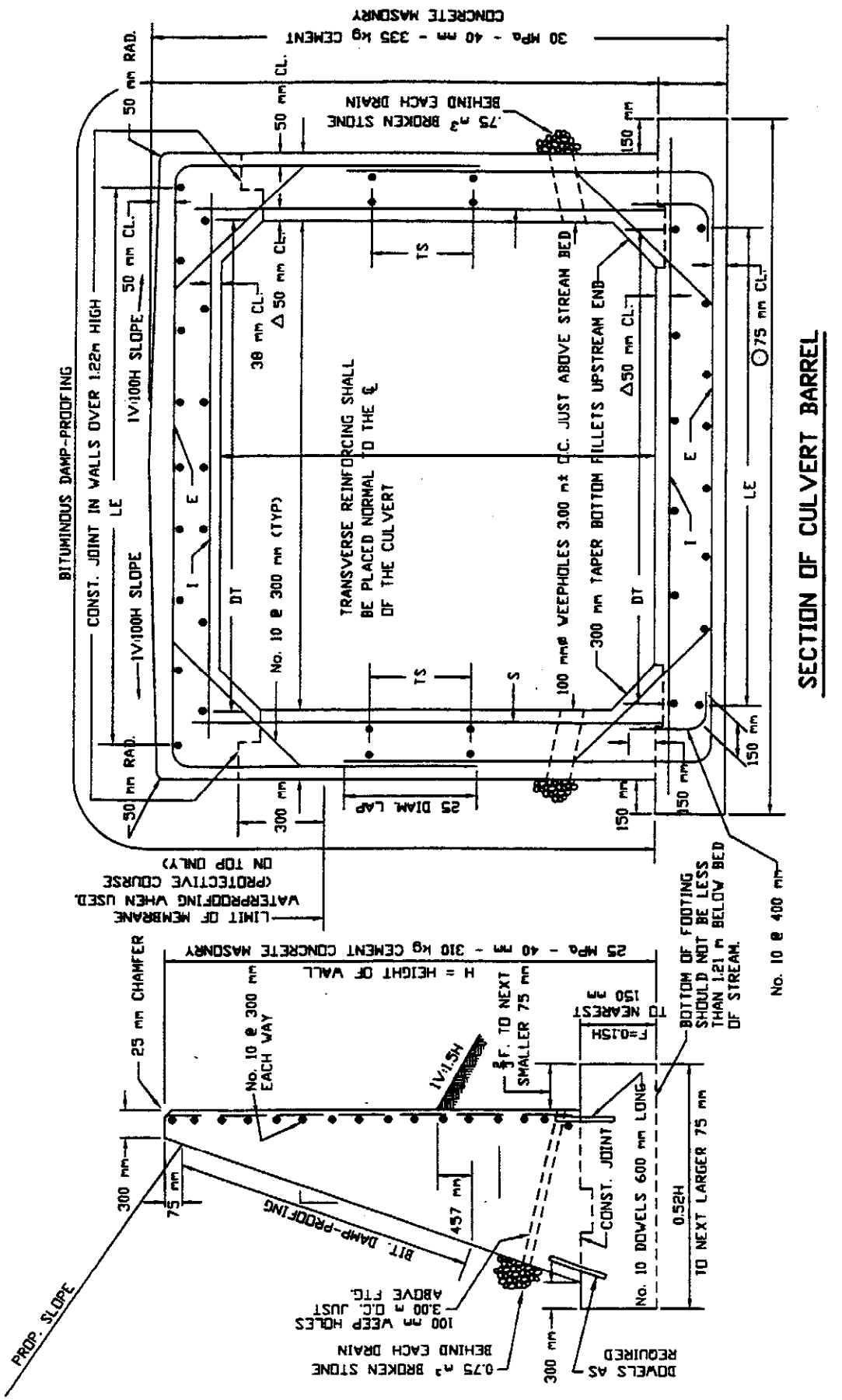
1. ENDS OF CULVERTS TO BE PARALLEL TO ℄ OF CONSTRUCTION UP TO 3.00 m OF COVER. WHERE HEIGHT OF COVER IS 3.00 m OR MORE, ENDS OF CULVERTS ARE TO BE SQUARE REGARDLESS OF SKEW OF CULVERT.
2. WHERE COVER MATERIAL IS LESS THAN 600 mm CONSULT MASS HIGHWAY DEPT. BRIDGE SECTION.
3. SEE BRIDGE MANUAL DRAWINGS 11.1.2 - 11.3.3.

MASS HIGHWAY CONSTRUCTION STANDARDS

REINFORCED CONCRETE BOX CULVERT

DATE OF ISSUE 9/22/95

DRAWING NUMBER **207.1.0**



SECTION OF CULVERT BARREL

△ INDICATES 75 mm IF EXPOSED TO SALT WATER.
○ INDICATES 100 mm IF EXPOSED TO SALT WATER.
WHERE EXPOSED TO SALT WATER INCREASE THE THICKNESS OF THE SIDEWALLS 25 mm AND THE BOTTOM SLAB 50 mm.

NOTE:
MEMBRANE WATERPROOFING WITH A WATERPROOFING PROTECTIVE COURSE WHERE ROADWAY PAVEMENT IS DIRECTLY ON STRUCTURE AND ON ALL STRUCTURES WHERE CLEAR SPAN IS OVER 6.0 m. USE BITUMINOUS DAMP-PROOFING WHERE ROADWAY PAVEMENT IS NOT DIRECTLY ON THE STRUCTURE AND WHERE CLEAR SPAN IS LESS THAN 6.0 m.
REFER TO DRAWINGS 207.4.0 AND 207.5.0 FOR ADDITIONAL INFORMATION.

MASS HIGHWAY CONSTRUCTION STANDARDS

REINFORCED CONCRETE BOX CULVERT

DATE OF ISSUE
9/22/95

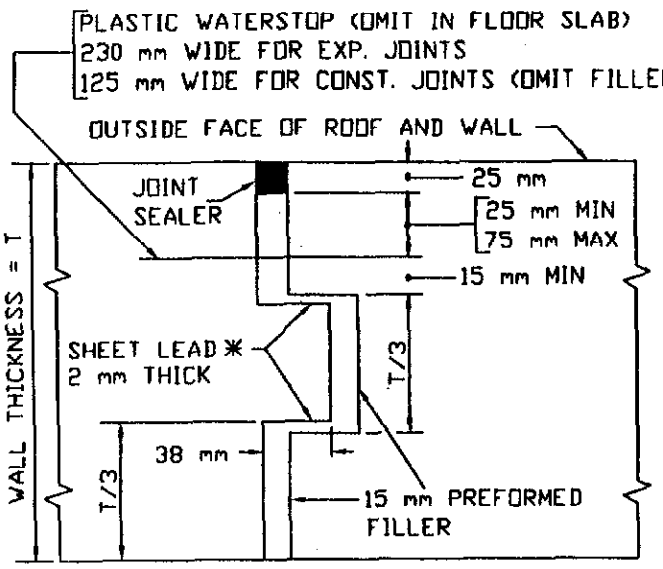
DRAWING NUMBER
207.2.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

DETAILS OF REINFORCED CONCRETE BOX CULVERT

DATE OF ISSUE 9/22/95

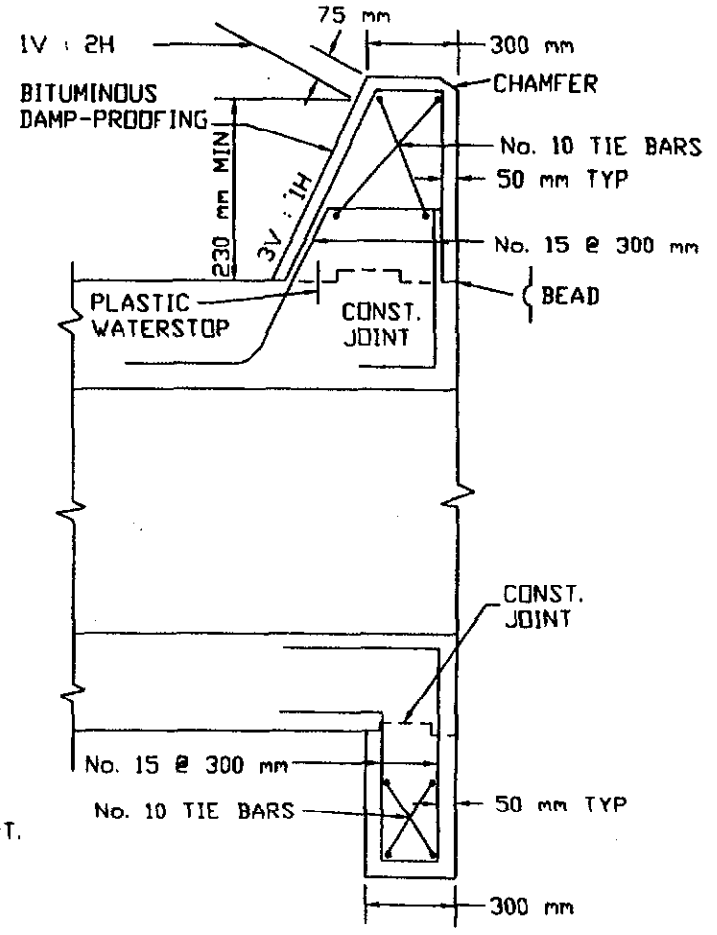
DRAWING NUMBER 207.3.0



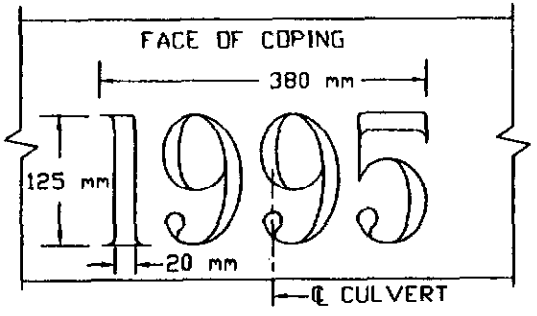
EXPANSION AND CONSTRUCTION JOINTS

A. WHERE CULVERT IS MORE THAN 60 m IN LENGTH, EXP. AND CONST. JOINTS ARE TO BE CARRIED INTO FLOOR OF CULVERT.
B. WHERE CULVERT IS MORE THAN 30 m IN LENGTH WITH ROADWAY EMBANKMENT MORE THAN 3.0 m (MEASURED FROM ROOF TO ROADWAY SURFACE) AND THE FOUNDATION SUPPORT IS GRAVEL BORROW FOR BRIDGE FOUNDATION, EXP. AND CONST. JOINTS ARE TO BE CARRIED INTO FLOOR OF CULVERT.
C. IN ALL OTHER CASES, EXPANSION JOINTS ARE CARRIED INTO THE FLOOR OF THE CULVERT AND CONST. JOINTS ARE OMITTED IN THE FLOOR OF THE CULVERT.
D. EXPANSION JOINTS ARE AT 30 m± AND CONST. JOINTS ARE AT 10 m±.

✱ OR AN APPROVED BY MHD RESEARCH & MATERIALS EQUIVALENT.



COPING AND CURTAIN WALL

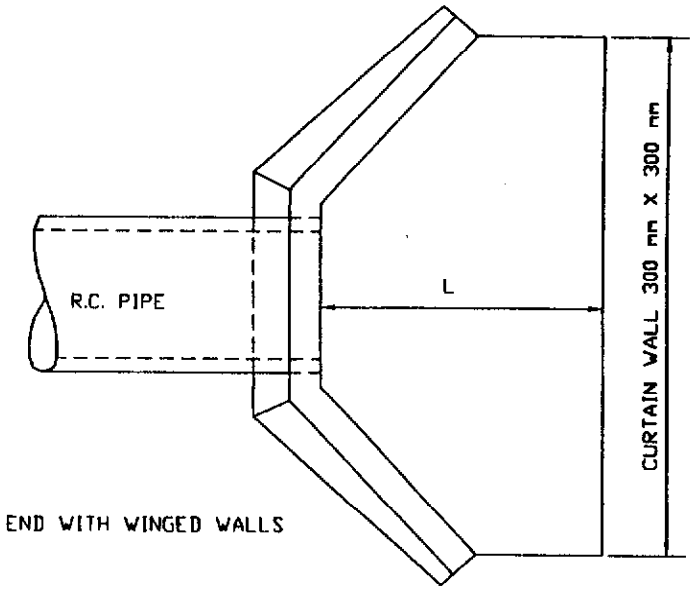


DATE ON COPING

(A Plan Sheet Will Be Furnished)

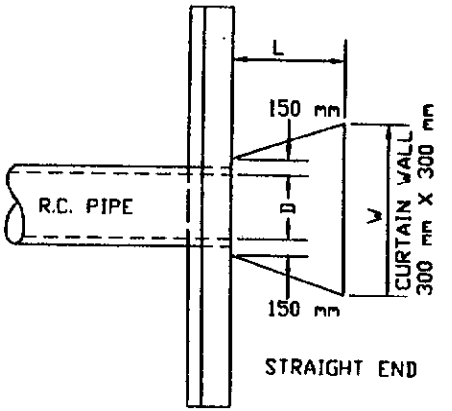
MASS HIGHWAY
CONSTRUCTION STANDARDS

CONCRETE SPLASH PADS



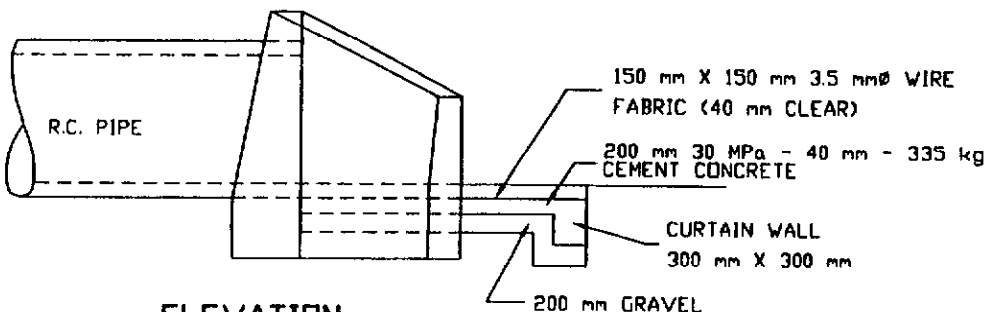
END WITH WINGED WALLS

PLAN

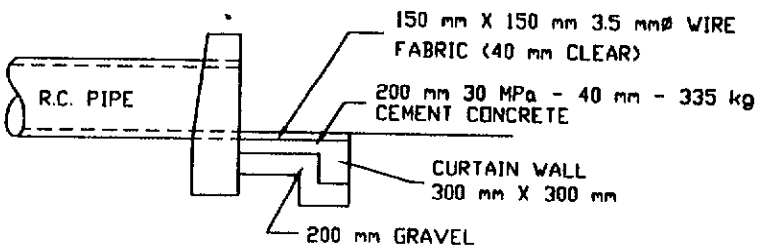


STRAIGHT END

PLAN



ELEVATION



ELEVATION

PIPE DIAM. (m)	0.9	1.1	1.2	1.4	1.5	1.7	1.8	2.1
L (m)	1.9	2.2	2.5	2.8	3.1	3.4	3.7	4.3

PIPE DIAM. (mm)	300	380	460	530	610	760
L (mm) OR (m)	920 mm	920 mm	920 mm	1.10 m	1.20 m	1.50 m
W (m)	1.20 m	1.20 m	1.40 m	1.60 m	1.80 m	2.30 m

NOTE:
1) ALL PIPE DIAMETERS NOMINAL SIZE

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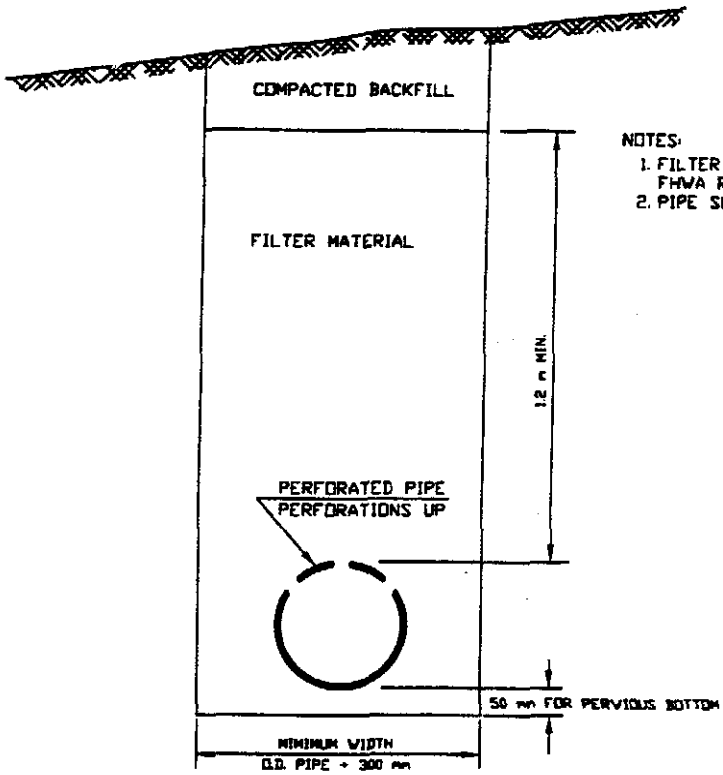
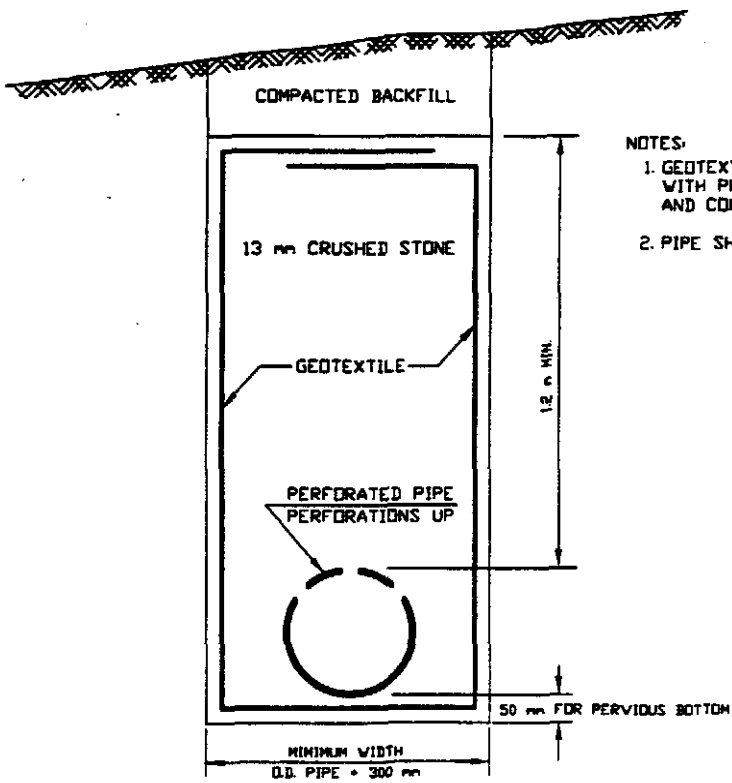


NOTES:

1. FILTER MATERIAL TO BE DESIGNED IN ACCORDANCE WITH PROCEDURES OF FHWA REPORT #FHWA-TS-80-224, HIGHWAY SUBGRADE DESIGN.
2. PIPE SHALL BE SET AT BOTTOM OF TRENCH FOR IMPERVIOUS BOTTOM.



NOTES:

1. GEOTEXTILE FABRIC TO BE DESIGNED AND INSTALLED IN ACCORDANCE WITH PROCEEDURES OF FHWA PUBLICATION HI-90-001 GEOTEXTILE DESIGN AND CONSTRUCTION GUIDELINES (APRIL 1990).
2. PIPE SHALL BE SET AT BOTTOM OF TRENCH FOR IMPERVIOUS BOTTOM.

MASS HIGHWAY
CONSTRUCTION STANDARDS

SUBDRAIN

DATE OF ISSUE
9/22/95

DRAWING NUMBER
209.1.0

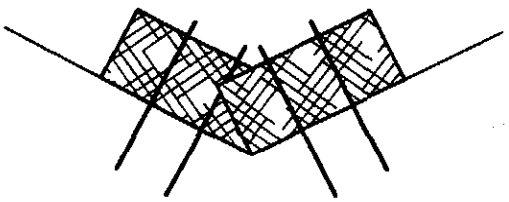
DURING A CONSTRUCTION PROJECT, SOIL EROSION CAN BE A MAJOR CONTRIBUTING FACTOR TO ENVIRONMENTAL POLLUTION. IN ORDER TO MINIMIZE THE EFFECT OF SEDIMENTATION, SCOUR, TURBULENCE, WASHOUTS, ETC. DURING CONSTRUCTION OPERATIONS, TEMPORARY, AND UNDER SOME CONDITIONS PERMANENT, CONTROLS MUST BE BUILT.

THE FORM AND DESIGN OF THE CONTROLS WILL VARY WITH THE TYPE OF AREA THAT IS TO BE PROTECTED AND THE SPECIFIC CAUSE OF THE ENVIRONMENTAL DEGRADATION. THE PROTECTIVE STRUCTURES MAY CONSIST OF:

- SEDIMENTATION POOLS FOR THE PROTECTION OF RIVERS, LAKES, STREAMS AND PONDS
- TEMPORARY BERMS TO CONTROL HEAVY RUNOFF, THUS PREVENTION WASHOUTS
- DITCHES AT TOES OF SLOPES
- CHECK DAMS AT WATERWAY CROSSINGS
- FILTERS AT DRAIN INLETS
- ENERGY DISSIPATORS AT DRAIN OUTLETS (i.e. SPLASH PADS, BULK STONE DEPOSITS, ETC.) AT CULVERT ENDS.

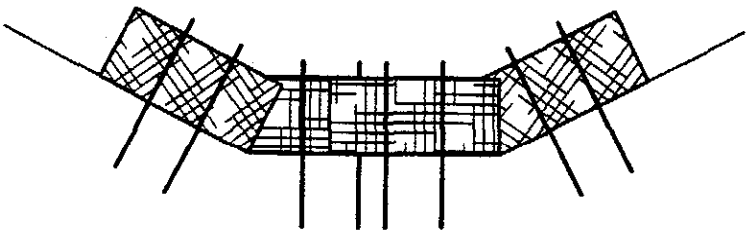
IN MOST SITUATIONS THE TYPE AND LOCATION OF POLLUTION CONTROL DEVICES CAN BE DETERMINED DURING THE DESIGN STAGE OF THE PROJECT. HOWEVER, FIELD CONDITIONS MAY WARRANT ADDITIONAL MEASURES AND CHANGES DURING THE CONSTRUCTION PHASE.

MANY TYPES OF PROTECTIVE SCHEMES AND DESIGNS CAN BE ADAPTED TO MEET A PARTICULAR CONDITION; IN SOME CASES CERTAIN MEASURES MAY HAVE TO BE INNOVATED. GENERALLY, THE VARIOUS SCHEMES DETAILED IN THE BOOKLET ENTITLED "TEMPORARY EROSION AND POLLUTION CONTROL MEASURES" PREPARED BY THE FEDERAL HIGHWAY ADMINISTRATION CAN BE APPLIED.



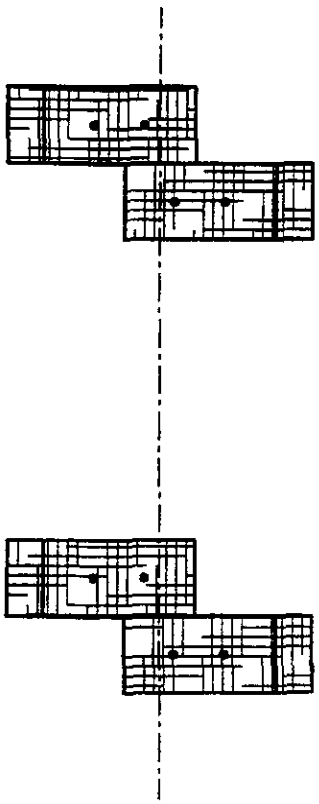
V DITCH

X-SECTION



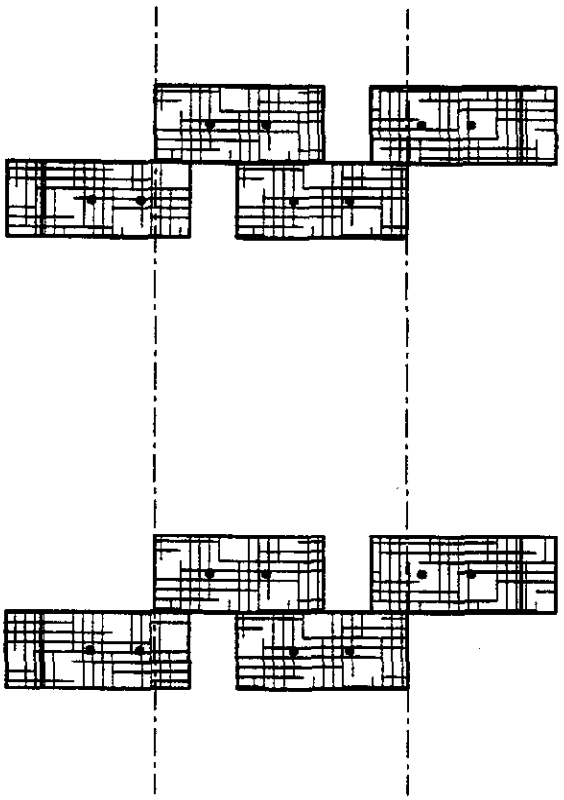
FLAT DITCH

X-SECTION



V DITCH

PLAN



FLAT DITCH

PLAN

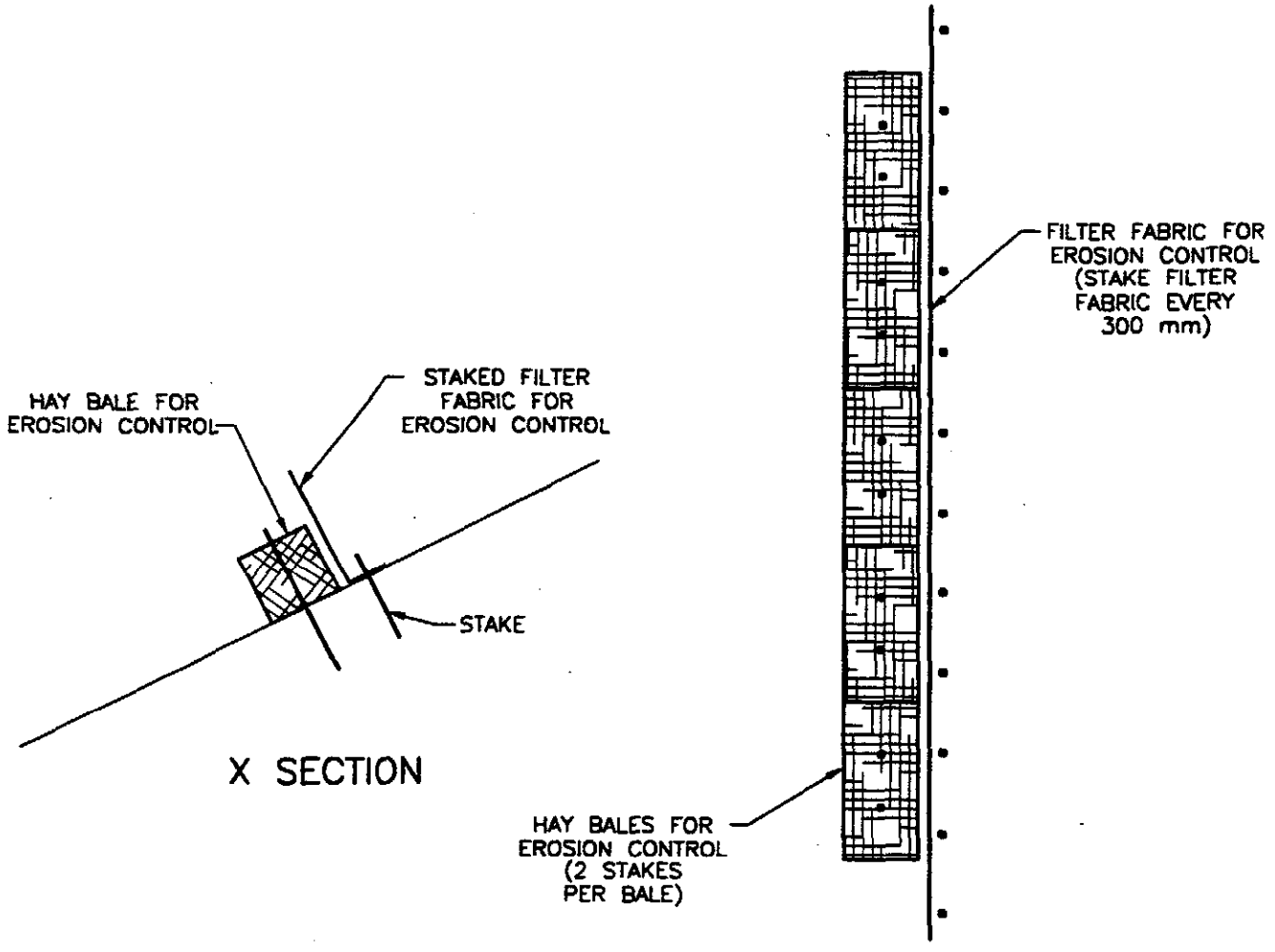
MASS HIGHWAY CONSTRUCTION STANDARDS

DITCH CHECK DAMS

FOR EROSION CONTROL

DATE OF ISSUE 9/22/95

DRAWING NUMBER **210.2.0**



MASS HIGHWAY CONSTRUCTION STANDARDS

HAY BALES AND SILT FENCES FOR EROSION CONTROL

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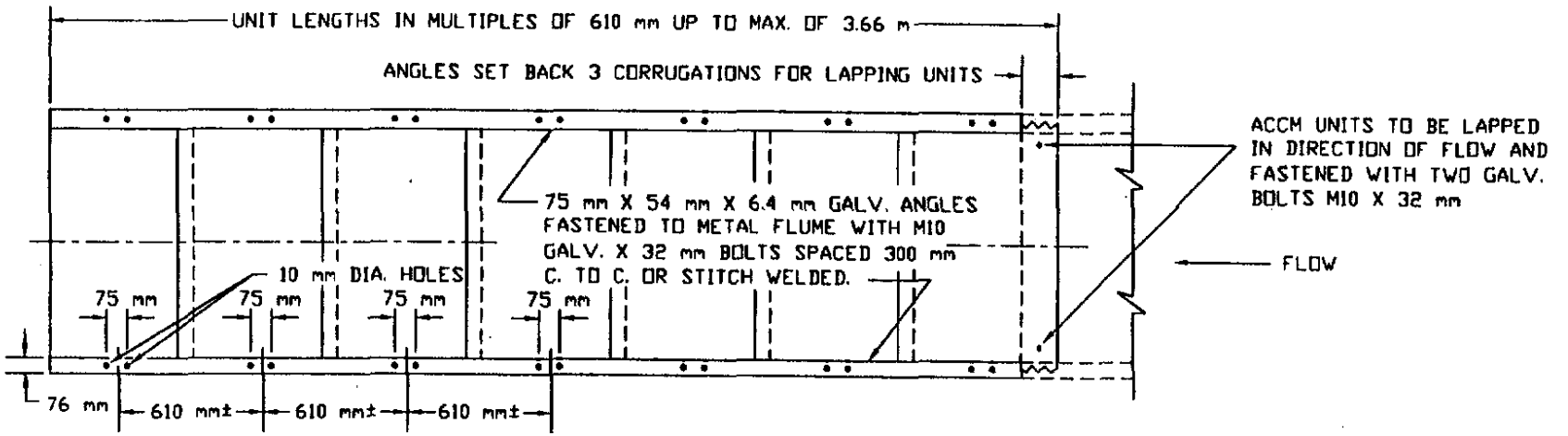
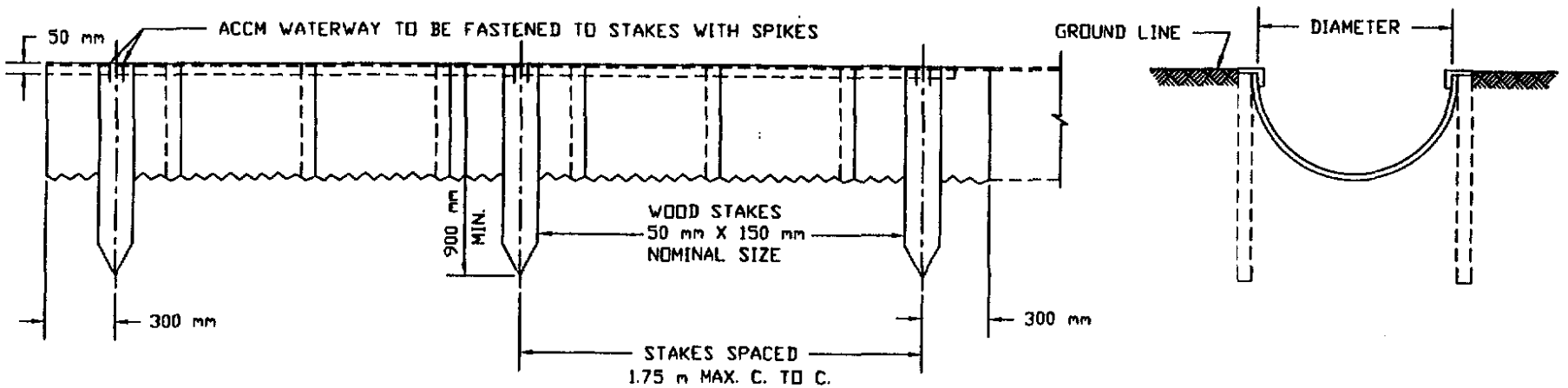
DRAWING NUMBER **210.3.0**

MASS HIGHWAY
CONSTRUCTION STANDARDS

HALF CIRCLE ACCM PIPE WATERWAYS





NOTE:

1. DIAMETER OF HALF ACCM PIPE WATERWAY TO BE AS SPECIFIED.
2. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

DATE OF ISSUE 9/22/95

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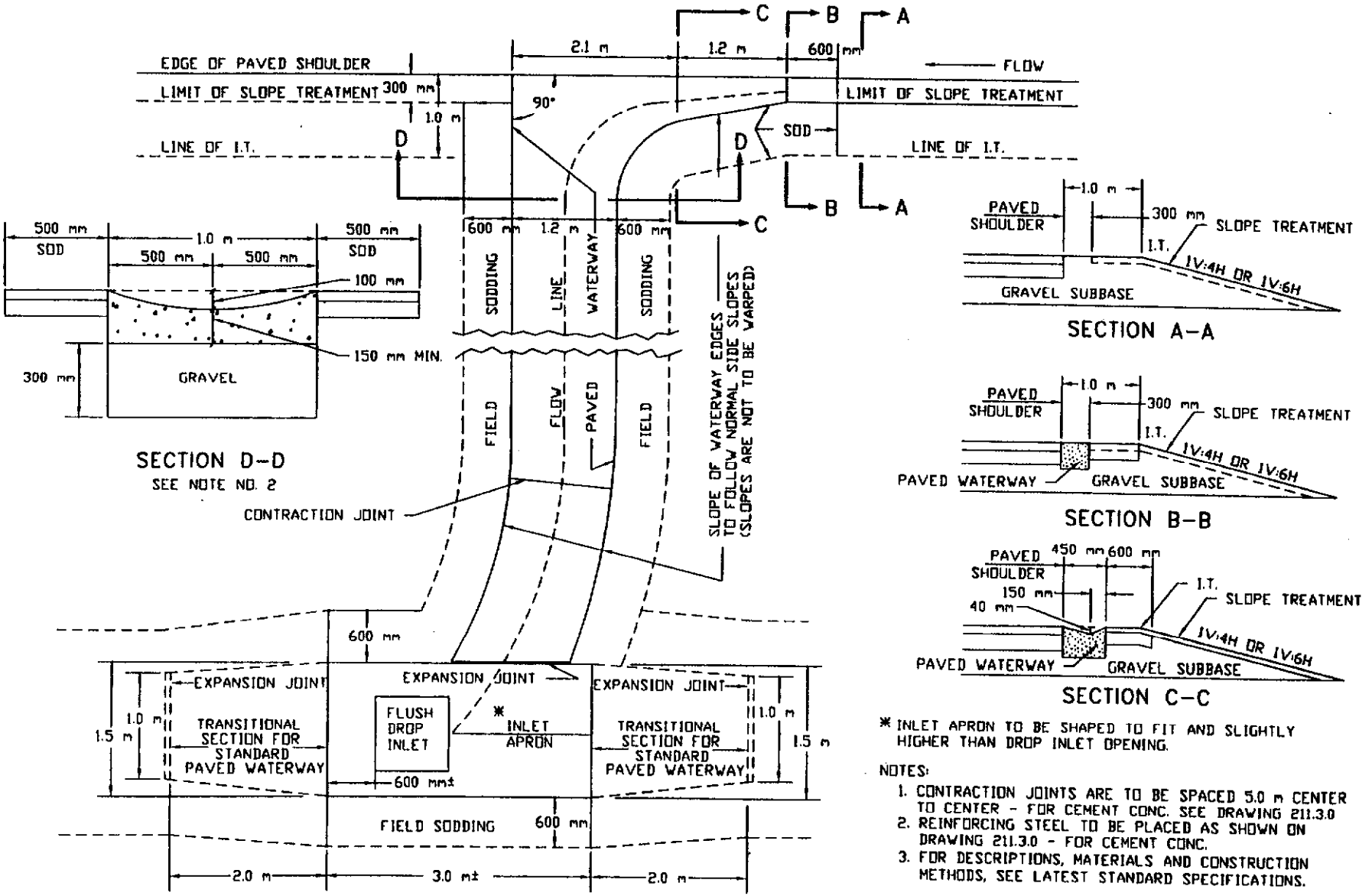
MASSHIGHWAY
CONSTRUCTION STANDARDS

PAVED WATERWAYS AND APRON



* INLET APRON TO BE SHAPED TO FIT AND SLIGHTLY HIGHER THAN DROP INLET OPENING.

NOTES:

1. CONTRACTION JOINTS ARE TO BE SPACED 5.0 m CENTER TO CENTER - FOR CEMENT CONC. SEE DRAWING 211.3.0
2. REINFORCING STEEL TO BE PLACED AS SHOWN ON DRAWING 211.3.0 - FOR CEMENT CONC.
3. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE LATEST STANDARD SPECIFICATIONS.

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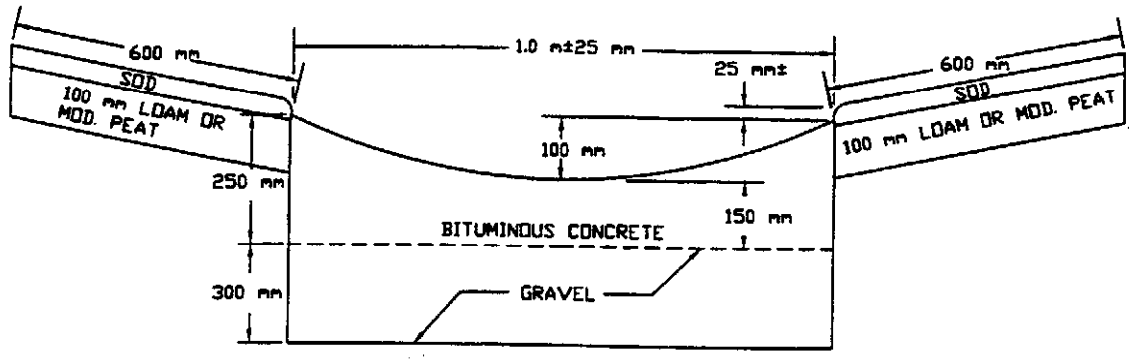
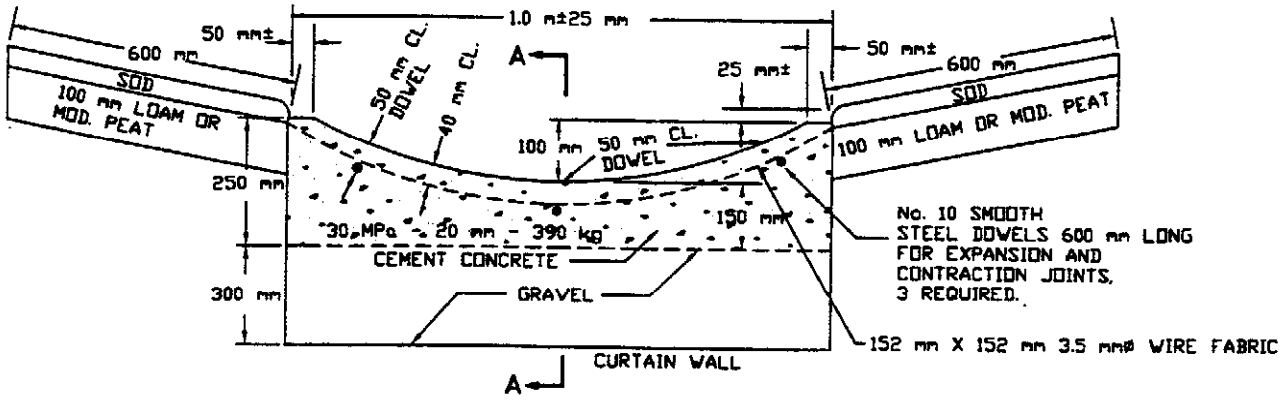
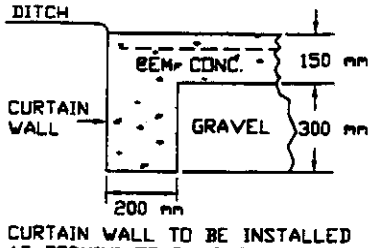
DRAWING NUMBER **211.2.0**



BITUMINOUS CONCRETE

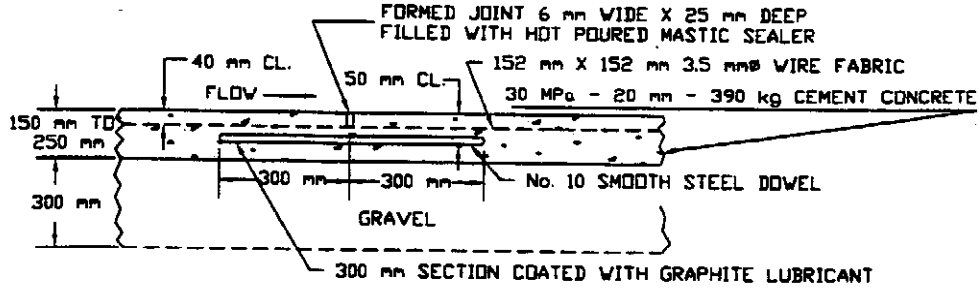


CEMENT CONCRETE



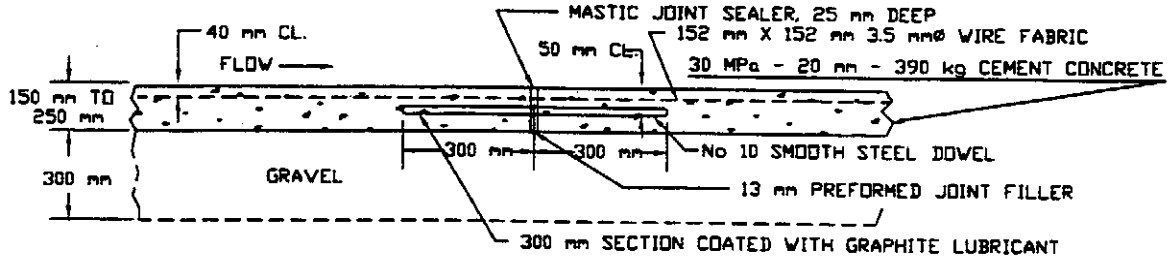
CURTAIN WALL TO BE INSTALLED AT TERMINI OF PAVING

SECTION A-A



CONTRACTION JOINT TO BE PLACED 5.0 m MAXIMUM CENTER TO CENTER

DETAILS OF CONTRACTION JOINTS



EXPANSION JOINTS TO BE INSTALLED AT APPROACHES TO STRUCTURES

DETAILS OF EXPANSION JOINTS

NOTES:

1. ON CURVED ALIGNMENT, WATERWAYS SHALL BE BANKED AS DIRECTED.
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE LATEST STANDARD SPECIFICATIONS.

MASS HIGHWAY CONSTRUCTION STANDARDS

PAVED WATERWAYS

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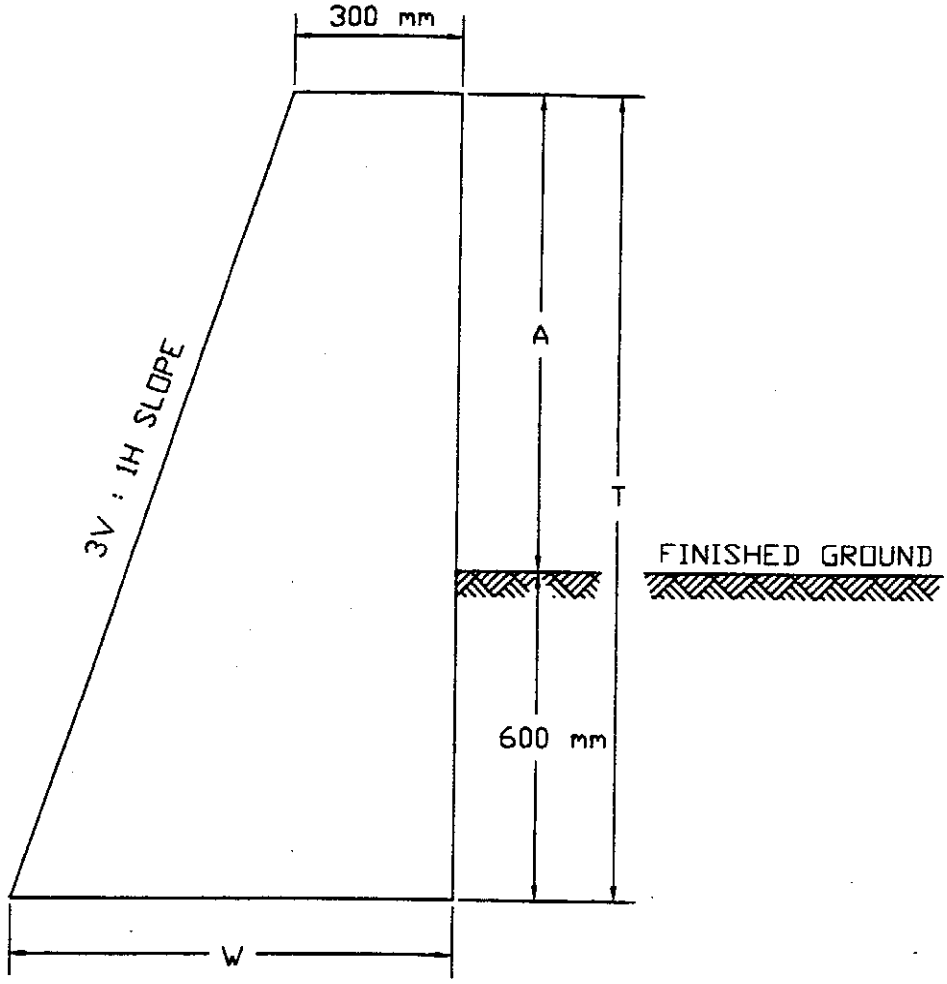
DRAWING NUMBER 211.3.0



NOTES:

1. 30 MPa - 40 mm - 335 kg CEMENT CONCRETE TO BE USED.
2. EXPANSION JOINTS TO BE PLACED 24.0 m O.C. MAXIMUM WITH INTERMEDIATE CONSTRUCTION JOINTS PLACED AT 8.0 m O.C. MAXIMUM.
3. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM.
4. PAYMENTS WILL BE BASED ON TABLE BELOW.

HEIGHTS		WIDTH	AREA m^2	m^3 PER m
A (mm) OR (m)	T (m)	W (mm) OR (m)		
600	1.20	700	0.600	0.600
750	1.35	750	0.709	0.709
900	1.50	800	0.825	0.825
1.05	1.65	850	0.949	0.949
1.20	1.80	900	1.080	1.080
1.35	1.95	950	1.219	1.219
1.50	2.10	1.00	1.365	1.365

MASS HIGHWAY CONSTRUCTION STANDARDS

LOW RETAINING WALLS

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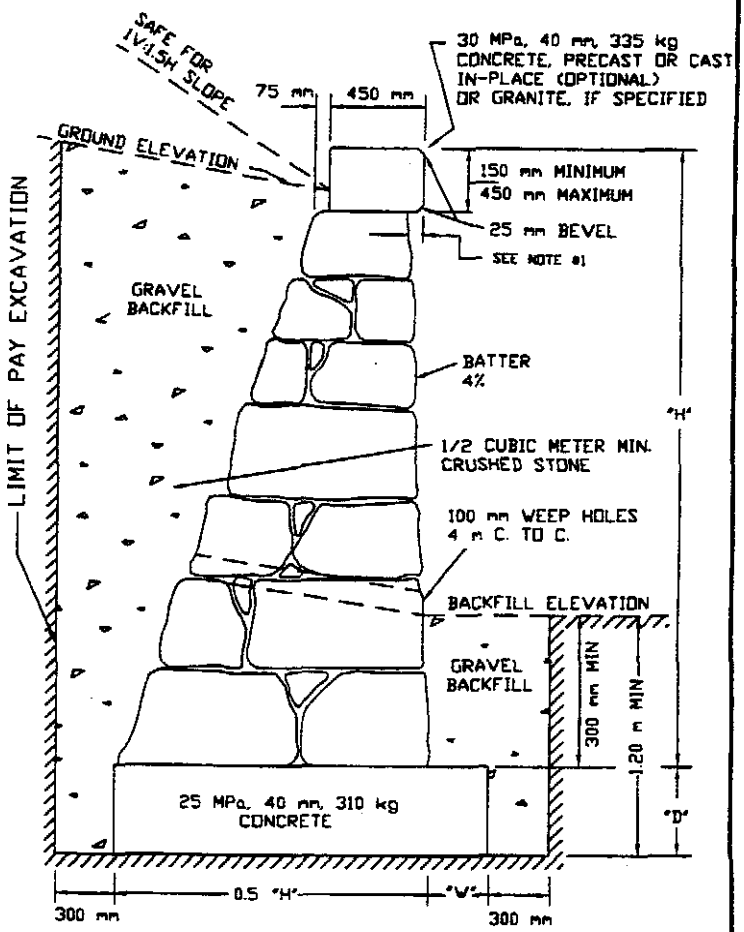
DRAWING NUMBER 302.1.0

H (m)	W (m)	D (m)	CONCRETE MASONRY FOOTING		STONE MASONRY EXCLUDING COPING	
			SECTION AREA (m^2)	VOLUME PER UNIT LENGTH (m^3/m)	SECTION AREA (m^2)	VOLUME PER UNIT LENGTH (m^3/m)
1.50	0.25	0.40	0.40	0.40	0.81	0.81
1.70			0.44	0.44	1.01	1.01
1.90			0.48	0.48	1.23	1.23
2.10			0.52	0.52	1.46	1.46
2.30			0.56	0.56	1.72	1.72
2.50			0.60	0.60	2.00	2.00
2.70	0.30	0.50	0.83	0.83	2.30	2.30
2.90			0.88	0.88	2.61	2.61
3.10			0.93	0.93	2.95	2.95
3.30			0.98	0.98	3.31	3.31
3.50	0.40	0.60	1.29	1.29	3.69	3.69
3.70			1.35	1.35	4.08	4.08
3.90			1.41	1.41	4.50	4.50
4.10			1.47	1.47	4.95	4.95
4.30			1.53	1.53	5.40	5.40
4.50			1.59	1.59	5.87	5.87
4.70	0.50	0.80	2.28	2.28	6.37	6.37
4.90			2.36	2.36	6.89	6.89
5.10			2.44	2.44	7.43	7.43
5.30			2.52	2.52	7.98	7.98
5.50			2.60	2.60	8.56	8.56
5.70			2.68	2.68	9.16	9.16
5.90			2.76	2.76	9.78	9.78
6.10	0.60	1.00	3.65	3.65	10.41	10.41
6.30			3.75	3.75	11.07	11.07
6.50			3.85	3.85	11.75	11.75
6.70			3.95	3.95	12.45	12.45
6.90			4.05	4.05	13.16	13.16
7.10			4.15	4.15	13.90	13.90
7.30			4.25	4.25	14.66	14.66
7.50			4.35	4.35	15.44	15.44
7.70			4.45	4.45	16.23	16.23
7.90			4.55	4.55	17.05	17.05
8.00			4.60	4.60	17.47	17.47



COPING TO BE PRECAST CONCRETE OR GRANITE OF UNIFORM DEPTH FOR THE ENTIRE LENGTH. DEPTH OF CONCRETE TO BE 1/10 THE AVERAGE "H" WITHIN THE LIMITS SHOWN. DEPTH OF GRANITE TO BE AS SHOWN ON THE PLANS, 150 mm OR 250 mm.

FOR CHAIN LINK FENCE ON TOP OF WALL, THE COPING SHALL BE CONCRETE CAST-IN-PLACE WITH A MINIMUM DEPTH OF 300 mm . THE LENGTH OF GALVANIZED PIPE SLEEVES FOR FENCE POSTS SHALL BE EQUAL TO THE DEPTH OF COPING.

NOTES:

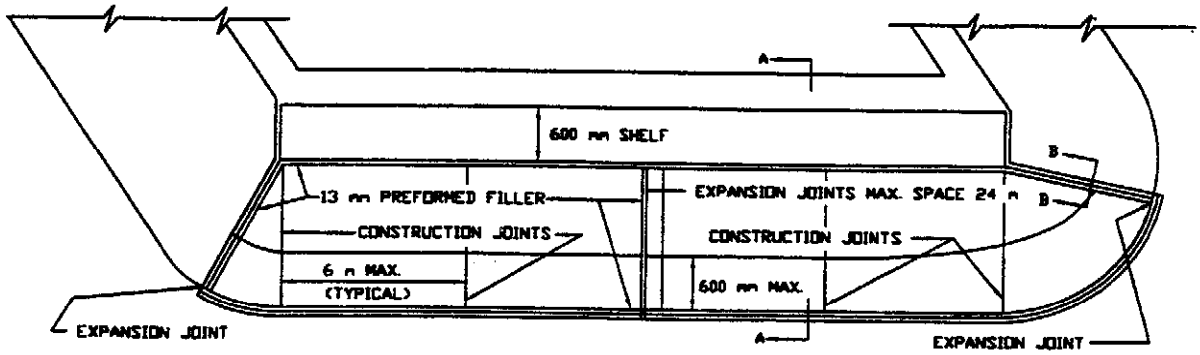
1. COPING OVERHANG TO BE APPROXIMATELY 75 mm FOR WALLS 3.00 m OR MORE IN HEIGHT AND APPROXIMATELY 50 mm FOR WALLS LESS THAN 3.00 m IN HEIGHT; IN A CONTINUOUS WALL OF VARYING HEIGHT THE OVERHANG WILL BE APPROXIMATELY 50 mm TO 75 mm FOR THE ENTIRE LENGTH.
2. ALL DIMENSIONS SHOWN ARE MINIMUM.
3. PAYMENT WILL BE BASED ON THE ACCOMPANYING TABLE.

MASS HIGHWAY CONSTRUCTION STANDARDS

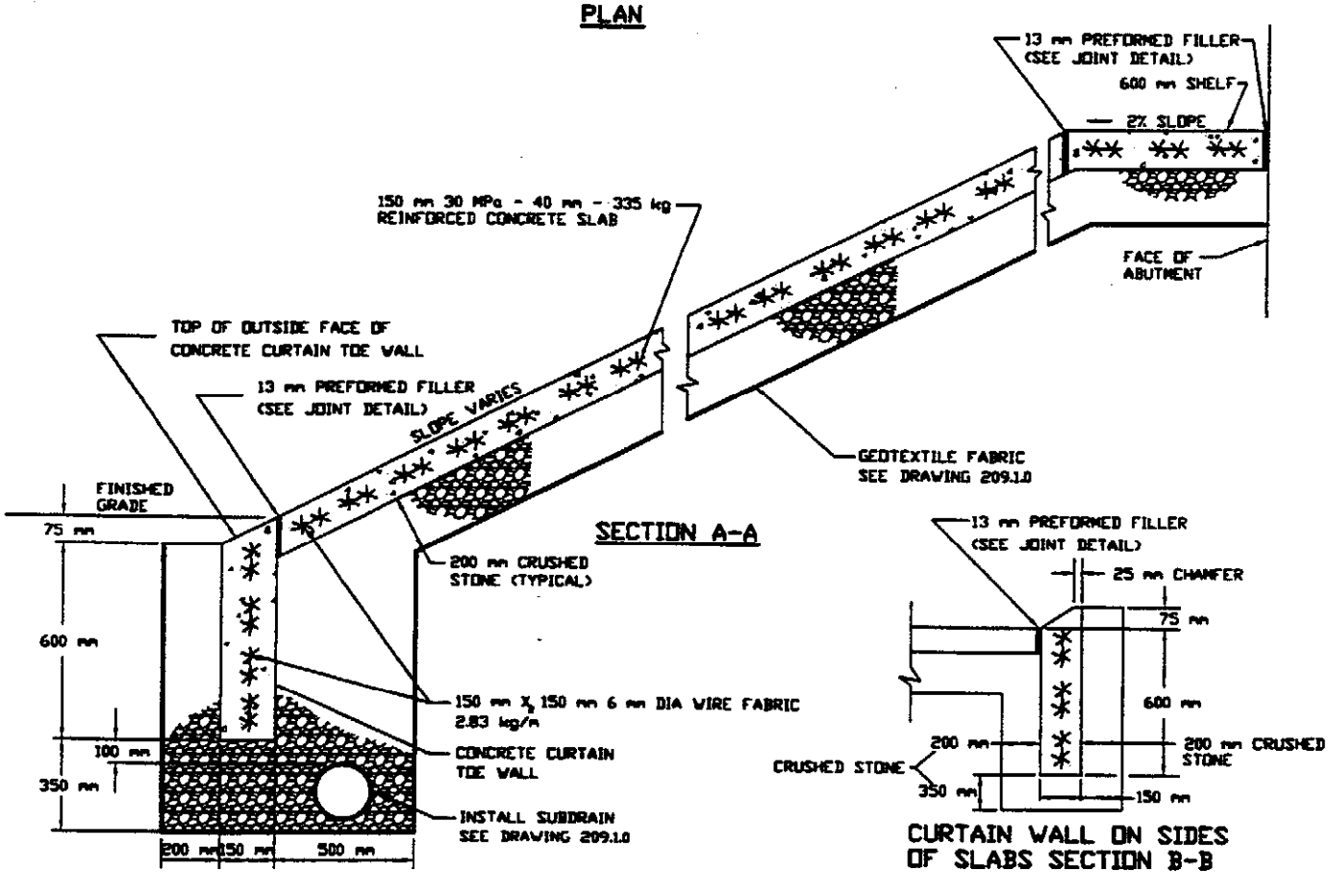
CEMENTED STONE MASONRY WALL

DATE OF ISSUE 9/22/95

DRAWING NUMBER **302.2.0**

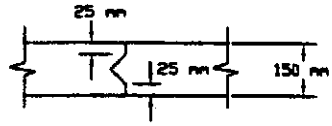


PLAN

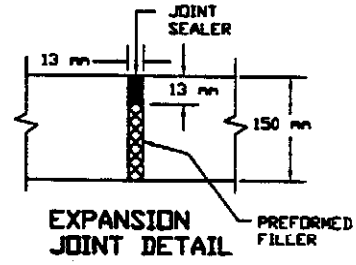


SECTION A-A

CURTAIN WALL ON SIDES
OF SLABS SECTION B-B



CONSTRUCTION
JOINT DETAIL



EXPANSION
JOINT DETAIL

NOTES:

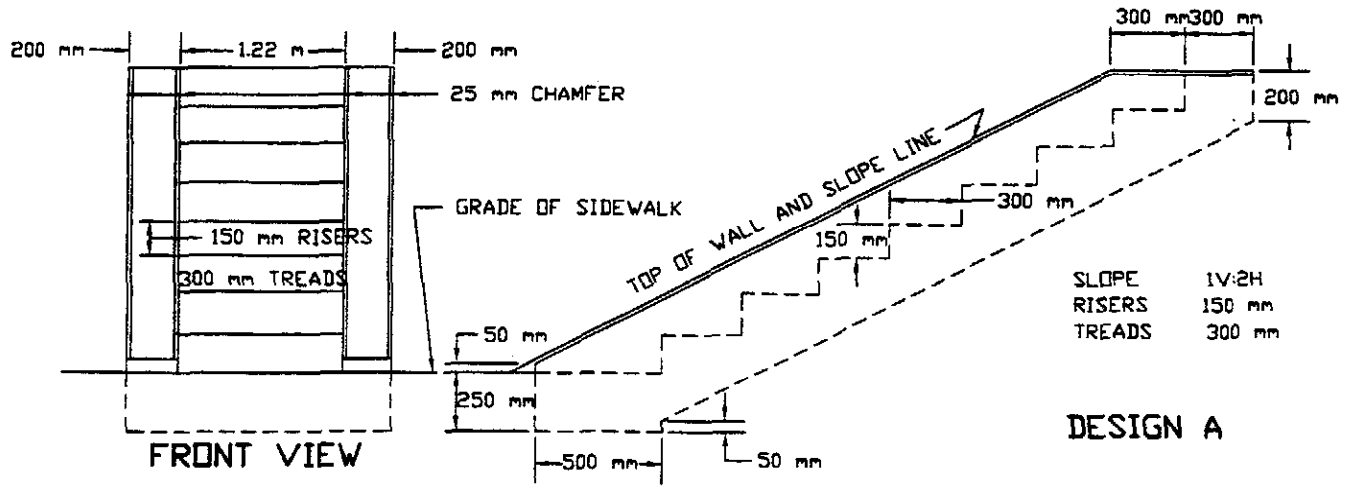
1. WIRE FABRIC TO HAVE 300 mm MINIMUM LAP AT SPLICE AND SHOULD EXTEND WITHIN 75 mm OF ALL EDGES
2. SLAB SHALL BE GROOVED PARALLEL TO AND NORMAL TO THE CURTAIN TOE WALL AT APPROXIMATELY 1.83 m GRIDS. THE GROOVE DEPTH SHALL BE 25 mm
3. FOR LIMITS OF SLOPE PAVING SEE BRIDGE MANUAL.
4. CONCRETE SHALL BE 30 MPa - 40 mm - 335 kg
5. EXTEND GEOTEXTILE FABRIC BENEATH CRUSHED STONE FROM TOP OF CONCRETE CURTAIN TOE WALL TO FACE OF ABUTMENT.

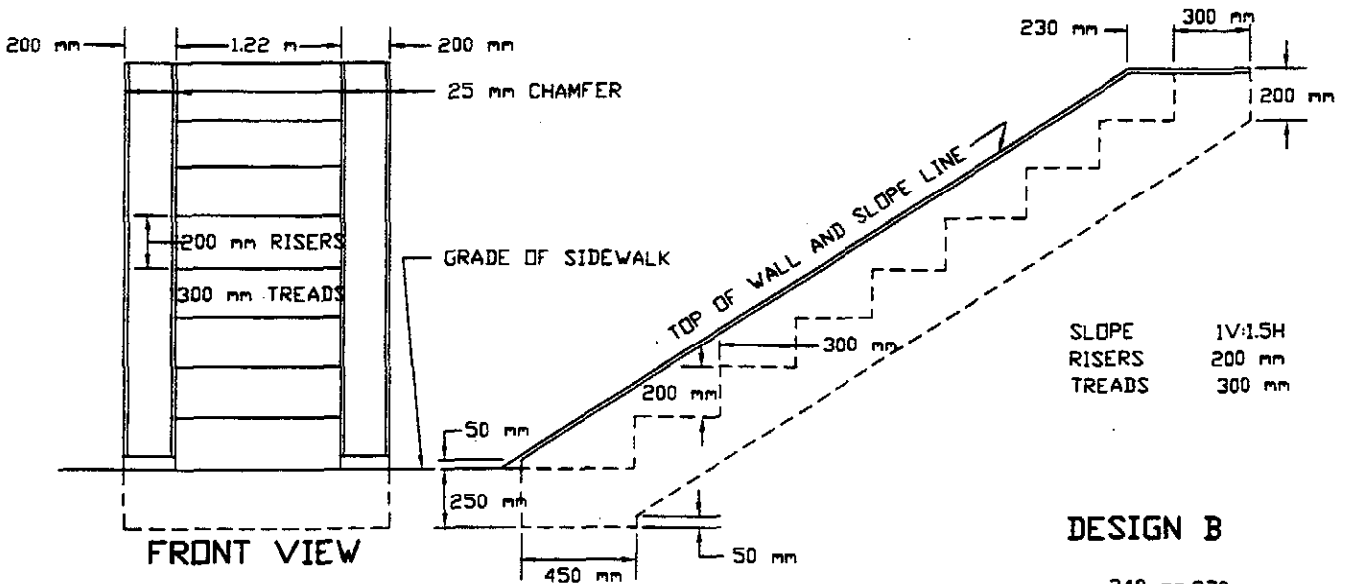
MASS HIGHWAY
CONSTRUCTION
STANDARDS

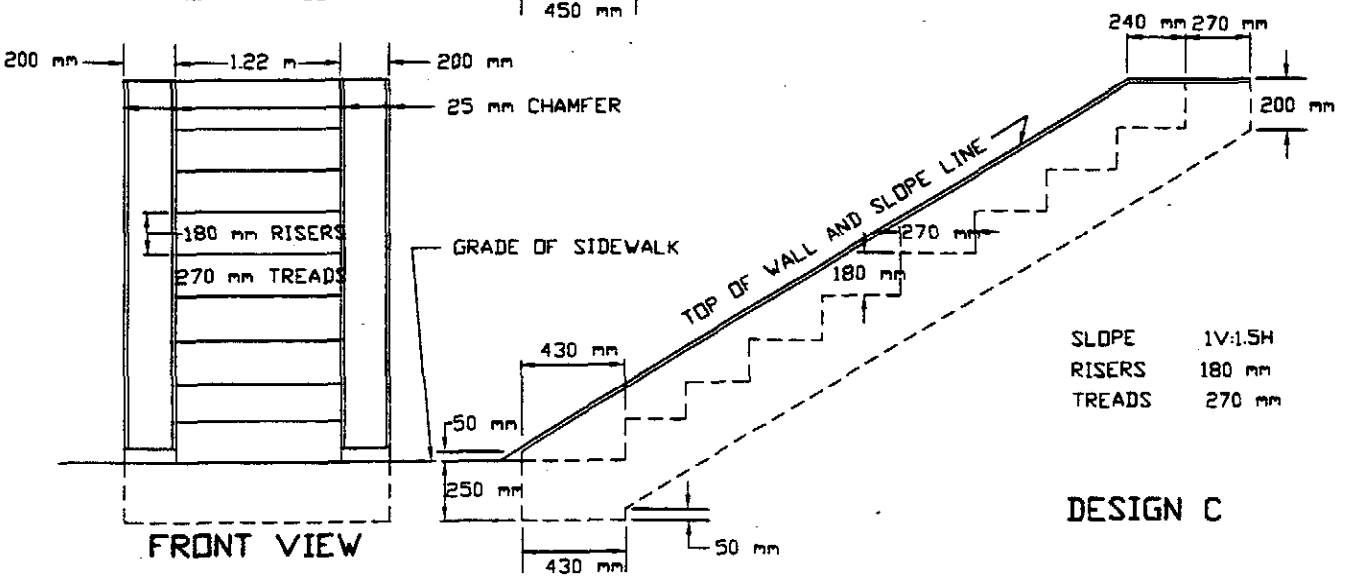
SPECIAL SLOPE PAVING UNDER BRIDGES 30 MPa – 40 mm – 335 kg REINFORCED CONCRETE SLAB

DATE OF ISSUE
9/22/95

DRAWING NUMBER
303.1.0







NOTES:

1. WHERE GALV. STEEL PIPE IS REQUIRED SEE DRAWING 409.1.0
2. ALL CONCRETE DIMENSIONS SHOWN ARE MINIMUM EXCEPT RISERS AND TREADS WHICH HAVE 5 mm TOLERANCE.
3. FOR REINFORCING STEEL AND CONCRETE QUANTITIES SEE DRAWING 304.2.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

CEMENT CONCRETE STEPS

DATE OF ISSUE
9/22/95

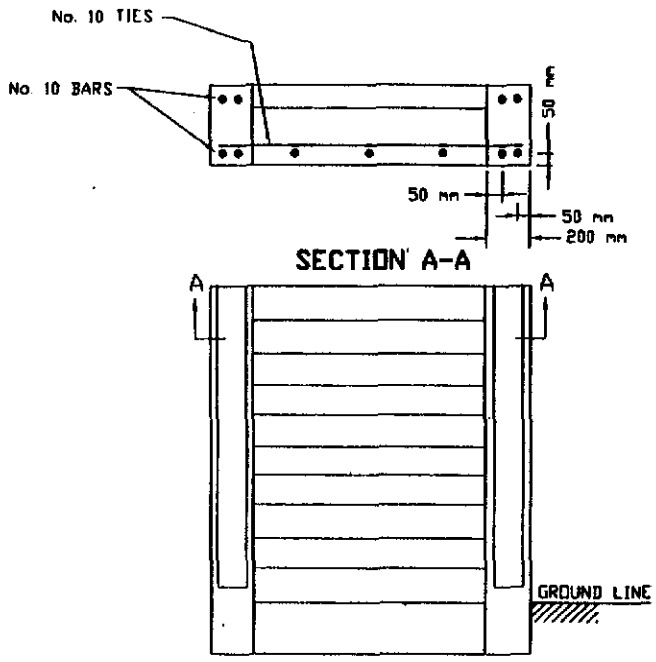
DRAWING NUMBER
304.1.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

CEMENT CONCRETE STEPS

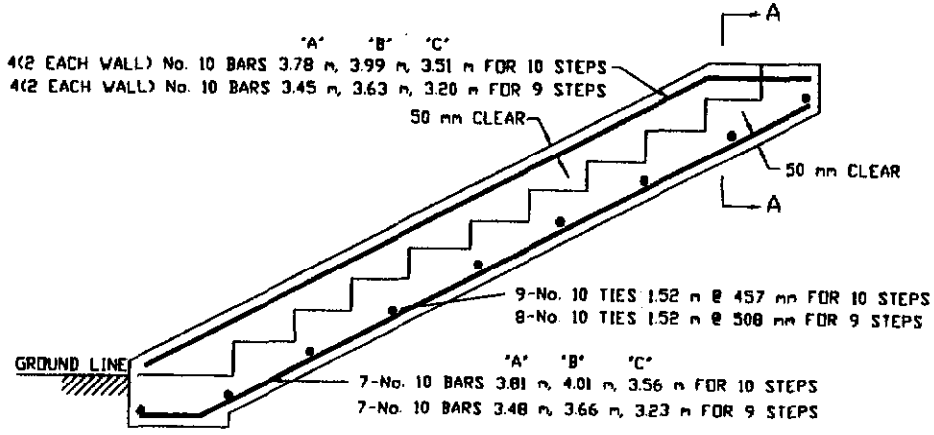
DRAWING NUMBER **304.2.0**

DATE OF ISSUE 9/22/95



FRONT VIEW

NOTES:
1. FOR DESCRIPTIONS , MATERIALS AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
2. PAYMENT WILL BE BASED ON THE QUANTITIES SHOWN IN THE ACCOMPANYING TABLES.



SIDE VIEW

FOR DESIGNS 'A', 'B' AND 'C' SEE DRAWING 304.1.0

DESIGN A						DESIGN B					DESIGN C				
STEP NOS.	QUANTITIES - m^3			TOTAL m^3	REINF. STEEL kg	QUANTITIES - m^3			TOTAL m^3	REINF. STEEL kg	QUANTITIES - m^3			TOTAL m^3	REINF. STEEL kg
	BASE	STEPS	2-WALLS			BASE	STEPS	2-WALLS			BASE	STEPS	2-WALLS		
2	0.16	0.21	0.18	0.55	--	0.14	0.23	0.18	0.55	--	0.13	0.19	0.16	0.48	--
3	0.16	0.31	0.24	0.71	--	0.14	0.34	0.25	0.73	--	0.13	0.28	0.22	0.63	--
4	0.16	0.42	0.30	0.88	--	0.14	0.45	0.32	0.91	--	0.13	0.38	0.28	0.79	--
5	0.16	0.52	0.37	1.05	--	0.14	0.57	0.39	1.10	--	0.13	0.47	0.33	0.93	--
6	0.16	0.62	0.43	1.21	--	0.14	0.68	0.46	1.28	--	0.13	0.57	0.39	1.09	--
7	0.16	0.73	0.49	1.38	--	0.14	0.79	0.53	1.46	--	0.13	0.66	0.45	1.24	--
8	0.16	0.83	0.55	1.54	--	0.14	0.91	0.60	1.65	--	0.13	0.76	0.51	1.40	--
9	0.16	0.93	0.62	1.71	45	0.14	1.02	0.67	1.83	47	0.13	0.85	0.56	1.54	42
10	0.16	1.04	0.68	1.88	49	0.14	1.13	0.74	2.01	51	0.13	0.95	0.62	1.70	46

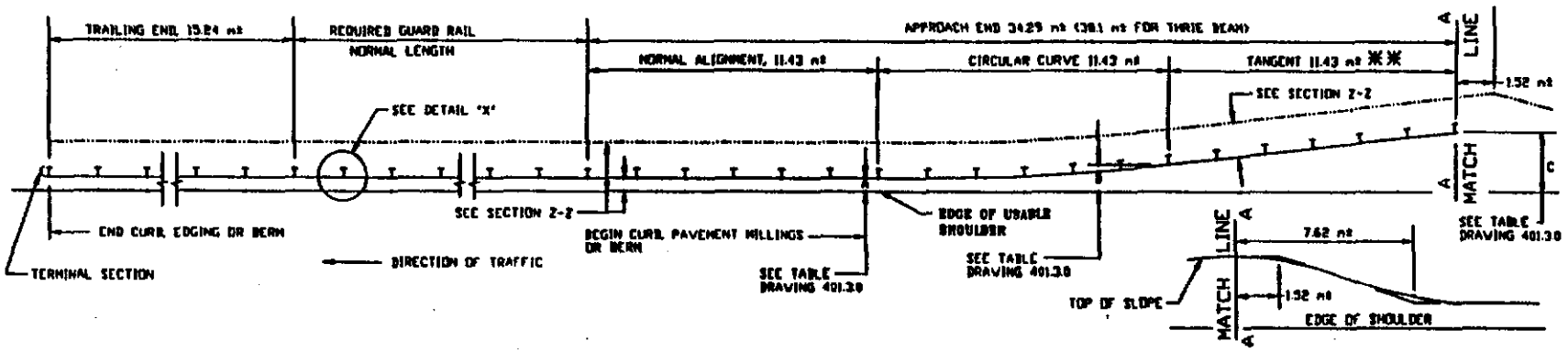
ALL CONCRETE SHALL BE 30 MPa - 40 mm - 335 kg

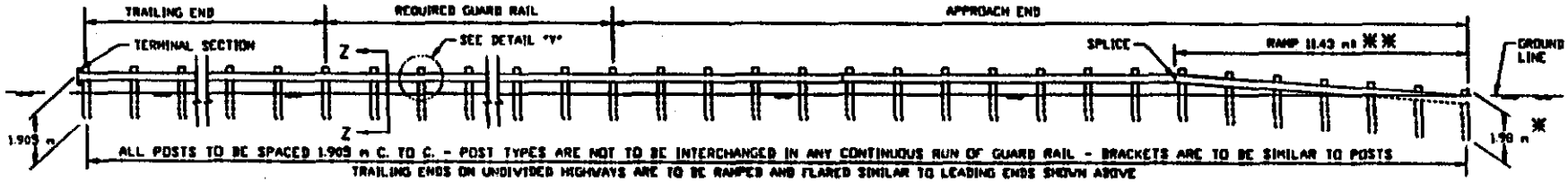
MASS HIGHWAY
CONSTRUCTION STANDARDS

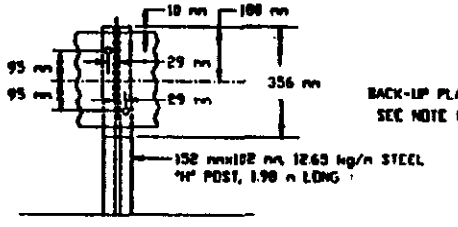
STEEL BEAM HIGHWAY GUARD – TYPE SS
TYPICAL INSTALLATION
FOR SPEEDS LESS THAN 80 km/hr

DATE OF ISSUE 2/3/97

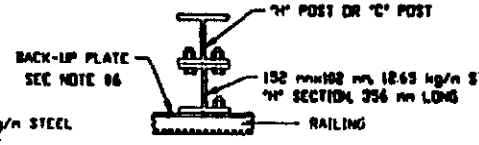
DRAWING NUMBER **401.1.0R**







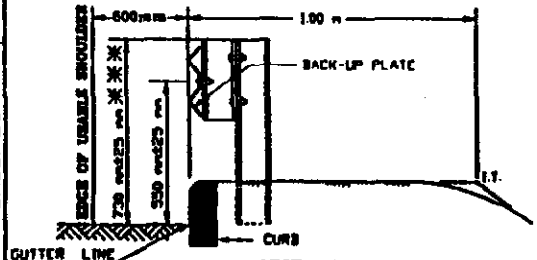
DETAIL "Y"



DETAIL "X"

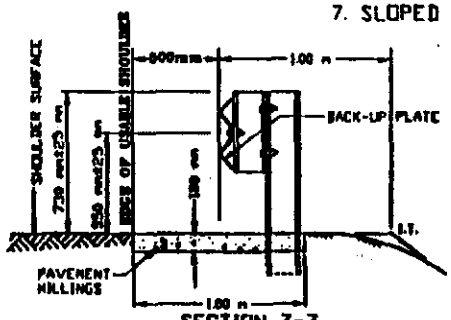
BURIED ENDS ONLY FOR SPEEDS LESS THAN 80 km/hr
* STANDARD LENGTH POST TO BE USED IN RAMPED SECTIONS.
** 15.24 m FOR THRIE BEAM.
*** WHEN PLACED IN MEDIAN, CHANGE TO THRIE BEAM AND HEIGHT 827 mm±25 mm. (NOTE ℄ HEIGHT IS ALWAYS 550 mm)

NOTES:
1. THIS METHOD OF INSTALLATION IS APPLICABLE WHEN THE EMBANKMENT SLOPE ADJACENT TO THE ROADWAY IS 1V:2H OR STEEPER.
2. LENGTHS OF HIGHWAY GUARD SHOWN ARE MEASUREMENTS ALONG THE FACE OF THE RAILING.
3. OTHER DETAILS ARE SHOWN ON DRAWINGS 401.5.0 - 401.10.0
4. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
5. FOR BACK-UP PLATE DETAILS SEE DRAWINGS 401.6.0 AND 401.8.0
6. DETAILS SHOWN HERE ALSO APPLY TO THRIE BEAM GUARD RAIL EXCEPT AS OTHERWISE NOTED.
7. SLOPED EDGING IS NOT TO BE USED



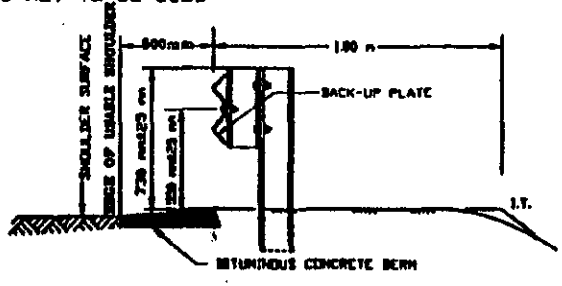
SECTION Z-Z

VERTICAL GRANITE CURB OR BITUMINOUS CONCRETE CURB ALONG EDGE OF SHOULDER



SECTION Z-Z

PAVEMENT MILLING MULCH



SECTION Z-Z

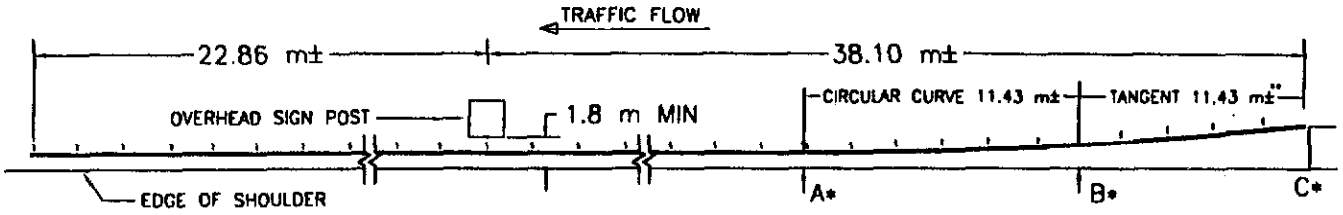
TYPE "A" BERM ALONG EDGE OF SHOULDER

MASS HIGHWAY
CONSTRUCTION STANDARDS

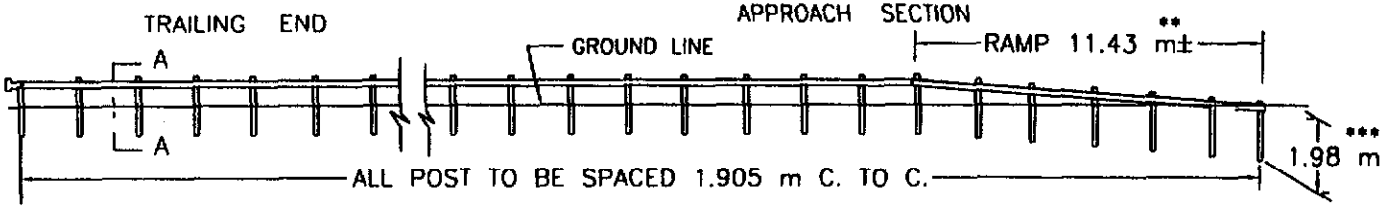
INSTALLATION FOR TYPE SS HIGHWAY GUARD FOR SIGN PROTECTION

DRAWING NUMBER **401.2.0**

DATE OF ISSUE 9/22/95



PLAN VIEW



ELEVATION VIEW

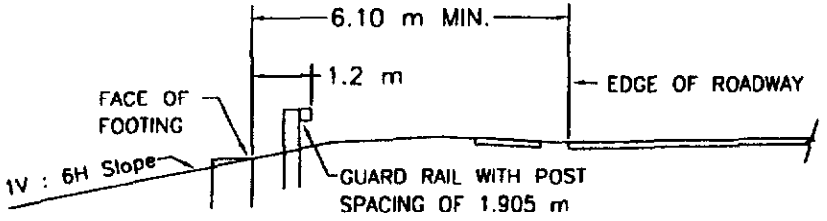
* SEE TABLE ON DRAWING 401.3.0 FOR DIMENSIONS

** 15.24 m FOR THRIE BEAM

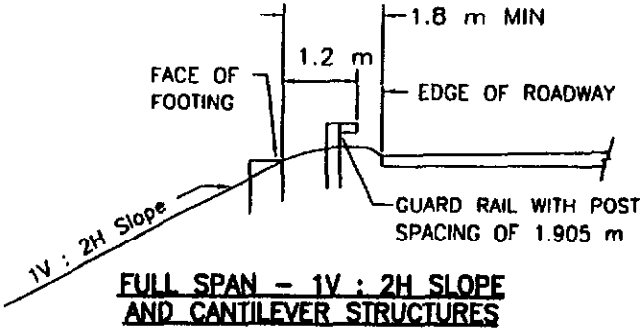
*** STANDARD LENGTH POSTS SHALL BE USED IN RAMPED SECTIONS

NOTES:

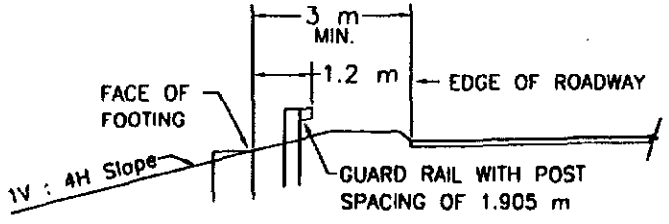
1. LENGTHS OF HIGHWAY GUARD SHOWN ARE MEASUREMENTS ALONG FACE OF RAILING.
2. FOR DESCRIPTIONS, MATERIAL AND AND CONSTRUCTION METHODS, SEE THE STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS 401.1.0 AND 401.5.0 – 401.10.0.
3. FOR BACK UP PLATE DETAILS SEE CONSTRUCTION DRAWINGS 401.6.0 AND 401.8.0.
4. DETAILS SHOWN HEREIN ALSO APPLY TO THRIE BEAM GUARD RAIL, EXCEPT AS OTHERWISE NOTED.
5. WHEN PLACED IN MEDIAN, CHANGE TO THRIE BEAM & HEIGHT OF 725mm + 25mm
6. POST TYPES SHALL NOT BE INTERCHANGED IN ANY CONTINUOUS RUN OF GUARD RAIL. BRACKETS SHALL SIMILAR TO POST.



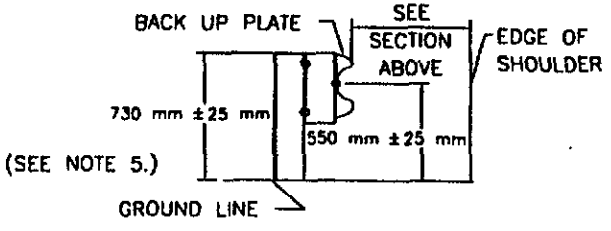
FULL SPAN – 1V : 6H SLOPE



FULL SPAN – 1V : 2H SLOPE AND CANTILEVER STRUCTURES



FULL SPAN – 1V : 4H SLOPE



SECTION A–A

TYPICAL INSTALLATION *

	A	B	C	
			W SECTION	THRIE BEAM
ALL GUARD RAIL CONFIGURATIONS SHOWN ON DWG. 401.1.0 SECTION Z-Z	0.5 m±	1.0 m±	2.0 m±	2.3 m±

NOTE: ALL MEASUREMENTS ARE FROM EDGE OF USABLE SHOULDER

FOR OVERHEAD SIGN PROTECTION **

	A	B	C	
			W SECTION	THRIE BEAM
1V : 2H SLOPE	457 mm±	991 mm±	1.98 m±	2.31 m±
1V : 4H SLOPE	1.83 m±	2.36 m±	3.35 m±	3.68 m±
1V : 6H SLOPE	4.88 m±	5.41 m±	6.40 m±	6.73 m±

* SEE DRAWING 401.1.0

** SEE DRAWING 401.2.0

MASS HIGHWAY CONSTRUCTION STANDARDS

TABLE OF OFFSETS FOR GUARD RAIL FLARED ENDS

DATE OF ISSUE 2/3/97

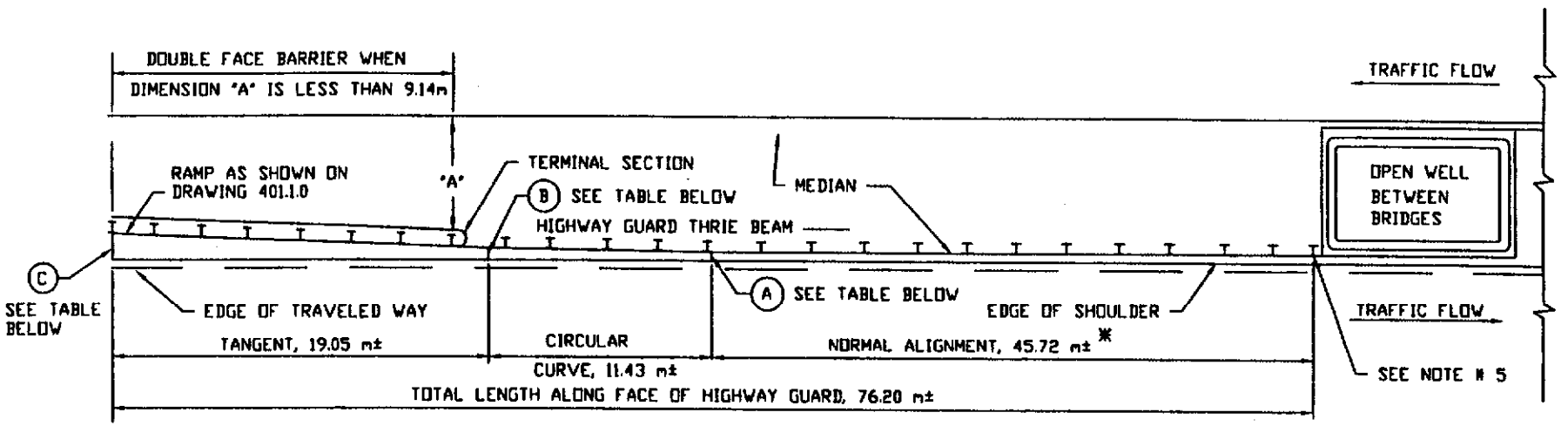
DRAWING NUMBER 401.3.0R

MASS HIGHWAY
CONSTRUCTION STANDARDS

INSTALLATION OF HIGHWAY GUARD ON MEDIAN WITH OPEN WELL BETWEEN BRIDGES

DATE OF ISSUE 9/22/95

DRAWING NUMBER **401.4.0**



	Ⓐ	Ⓑ	Ⓒ
CURB	229 mm±	762 mm±	2.67 m±
EDGING	457 mm±	991 mm±	2.90 m±
TYPE A BERM	610 mm±	1.14 m±	3.05 m±

* FACE OF RAILING SET AS SHOWN ON SECTION Z-Z DRAWING 401.1.0
WHEN THERE IS EDGING, CURBING OR BERM ALONG THE EDGE OF THE SHOULDER.

NOTES:

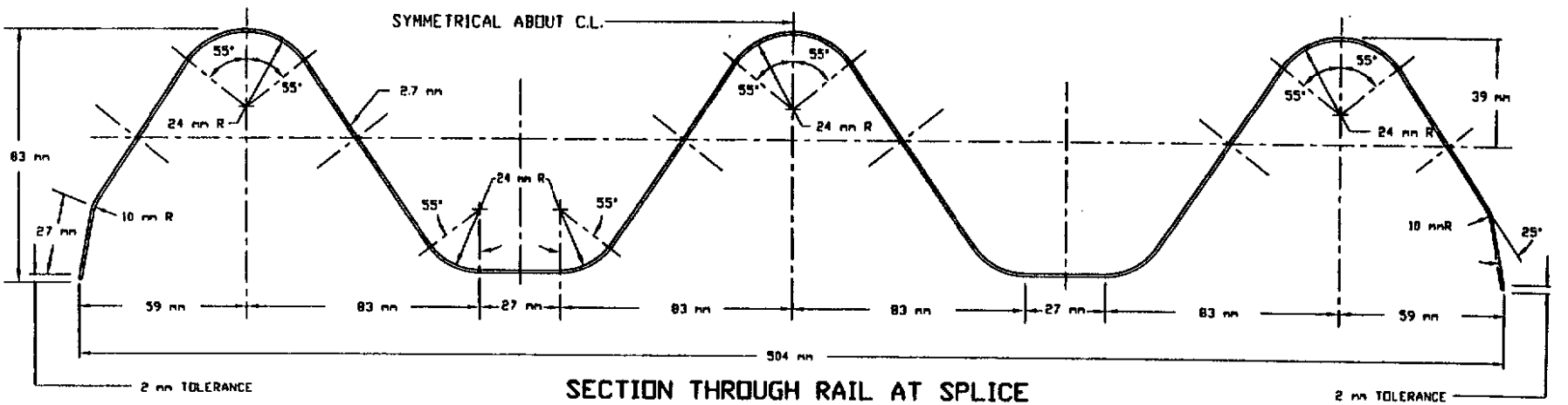
1. THIS TYPE OF INSTALLATION IS ONLY APPLICABLE WHERE HIGHWAY GUARD IS NOT NORMALLY REQUIRED.
2. SEE DRAWINGS 401.1.0, 401.5.0, 401.6.0, 401.9.0, 401.10.0
3. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.
4. ALL POSTS TO BE SPACED 1.91 m CENTER TO CENTER.
5. FOR DETAILS OF CONNECTION TO WALL, SEE DRAWINGS 402.7.0 - 402.10.0
6. POST TYPES ARE NOT TO BE INTERCHANGED IN ANY CONTINUOUS RUN OF GUARD RAIL; BRACKETS ARE TO BE SIMILAR TO POSTS.

MASS HIGHWAY
CONSTRUCTION STANDARDS

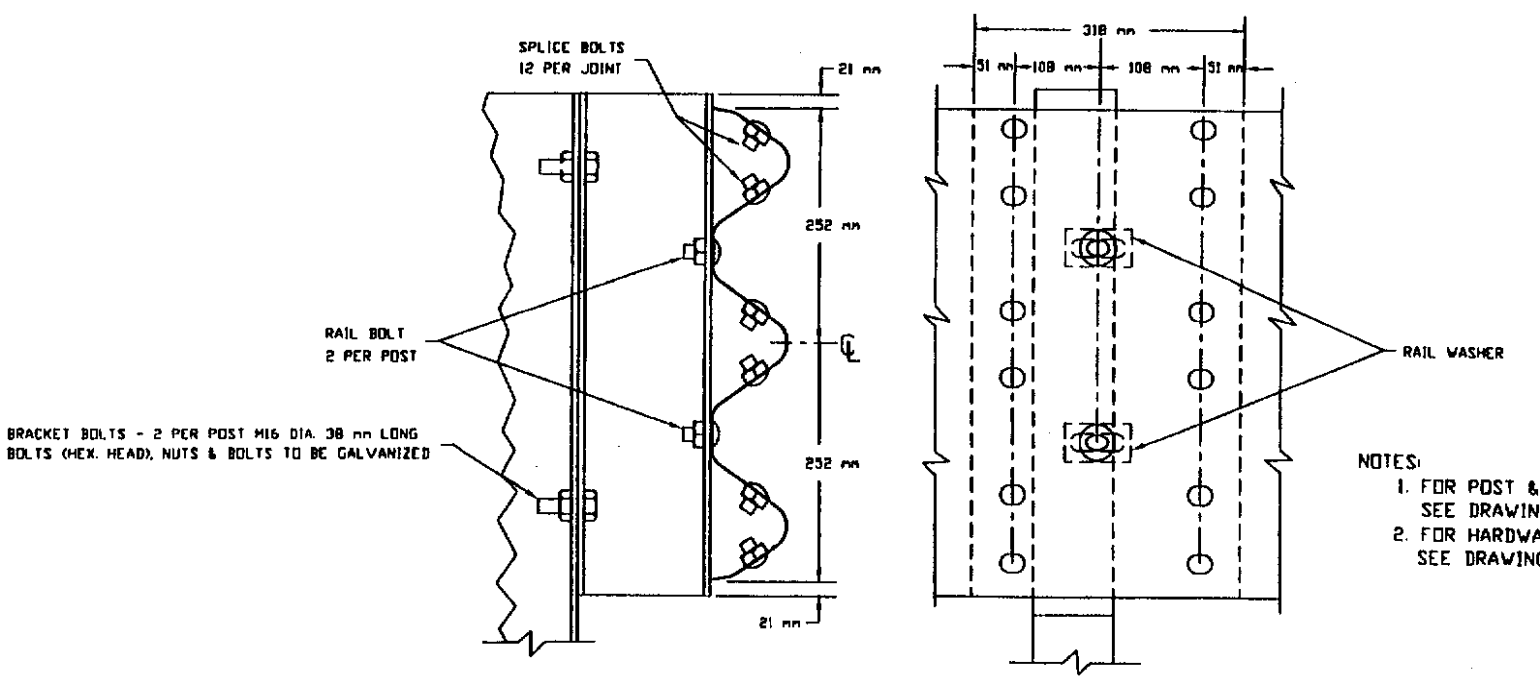
STEEL THRIE BEAM HIGHWAY GUARD
TYPE SS
RAIL DETAILS

DATE OF ISSUE 9/22/95

DRAWING NUMBER **401.5.0**



SECTION THROUGH RAIL AT SPLICE



NOTES:
1. FOR POST & BRACKET DETAILS SEE DRAWING 401.6.0
2. FOR HARDWARE DETAILS SEE DRAWING 401.7.0

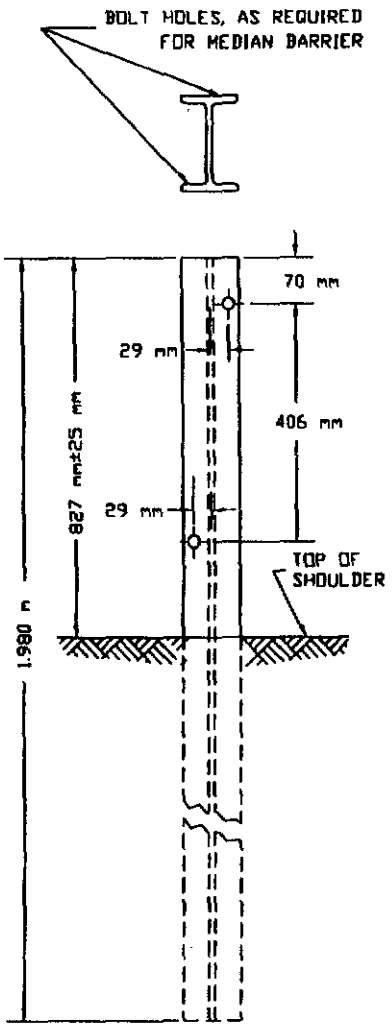
RAIL SPLICE

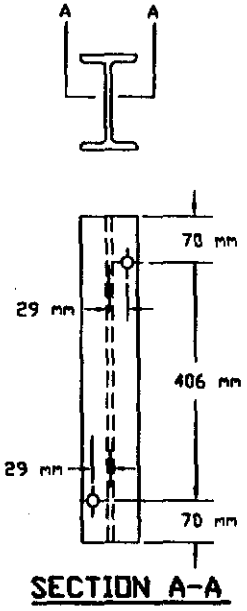
MASS HIGHWAY
CONSTRUCTION STANDARDS

STEEL THRIE BEAM HIGHWAY GUARD
TYPE SS
POST AND OFFSET BRACKET DETAILS

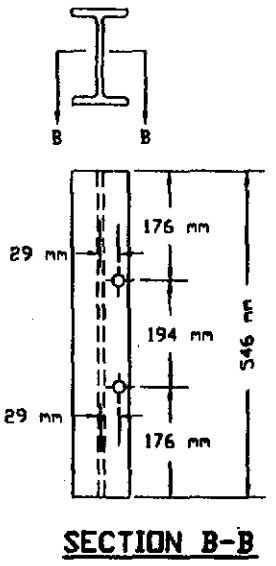
DATE OF ISSUE 9/22/95

DRAWING NUMBER **401.6.0**



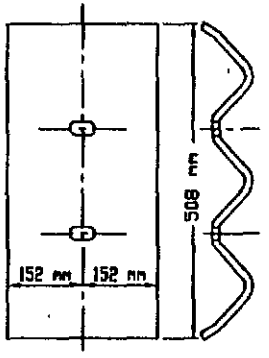


SECTION A-A

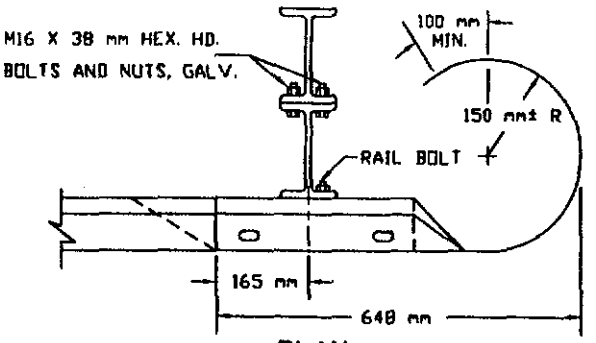


SECTION B-B

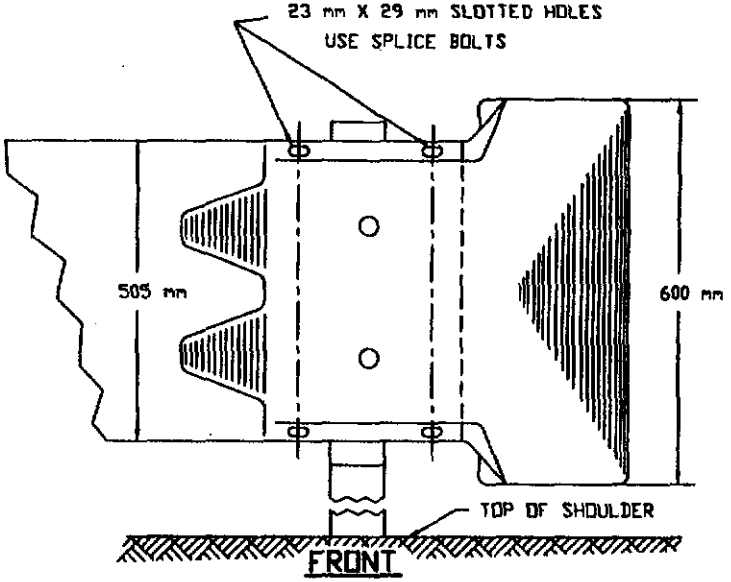
OFFSET BRACKET



BACK UP PLATE
2.7mm GAUGE



PLAN
TERMINAL SECTION



FRONT
TERMINAL SECTION

NOTES:
1. POST & BRACKET TO BE FABRICATED FROM W150 X 14 STEEL 'H' SECTIONS AS SHOWN.
2. POST & BRACKET BOLT HOLES TO BE 20 mm DIA. (STD. GALV. WASHERS TO BE USED AT THESE CONNECTIONS.)
3. FABRICATION DIMENSIONS ALSO APPLY TO 'C' POSTS AND BRACKETS.
4. BACK UP PLATE PLACED BEHIND RAIL ELEMENT AT INTERMEDIATE POST i.e. NON SPLICE POST, FOR SLOT DETAILS SEE DRAWINGS 401.7.0 AND 401.8.0

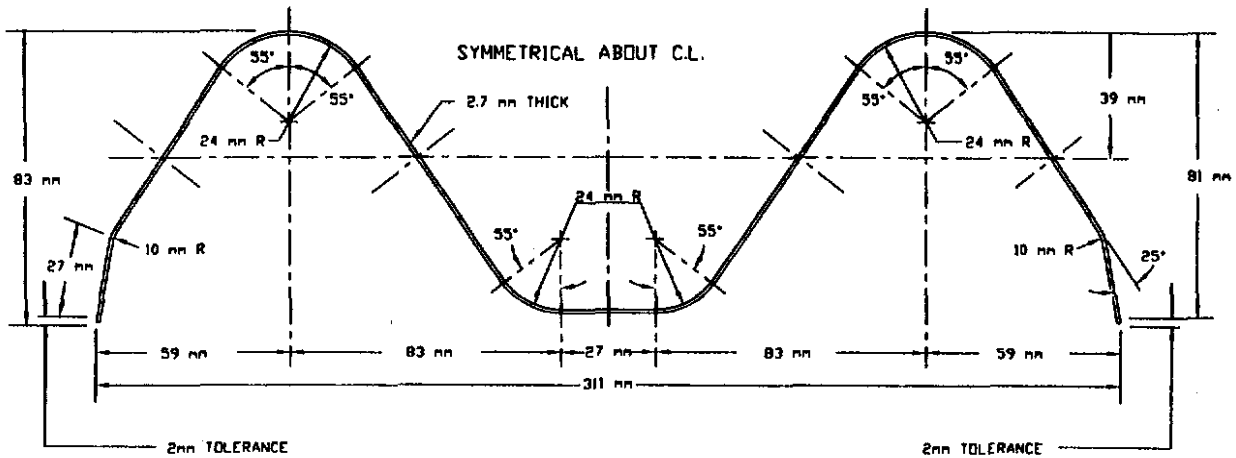
MASS HIGHWAY
CONSTRUCTION STANDARDS

STEEL BEAM HIGHWAY GUARD
TYPE SS
W-RAIL SECTION

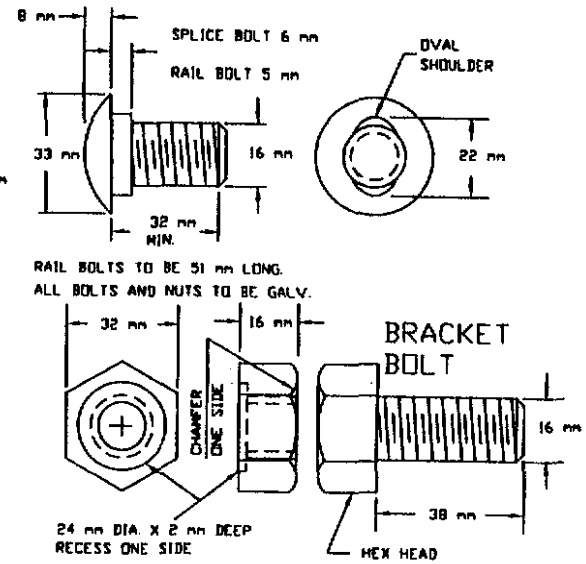
DATE OF ISSUE 9/22/95

DRAWING NUMBER **401.7.0**

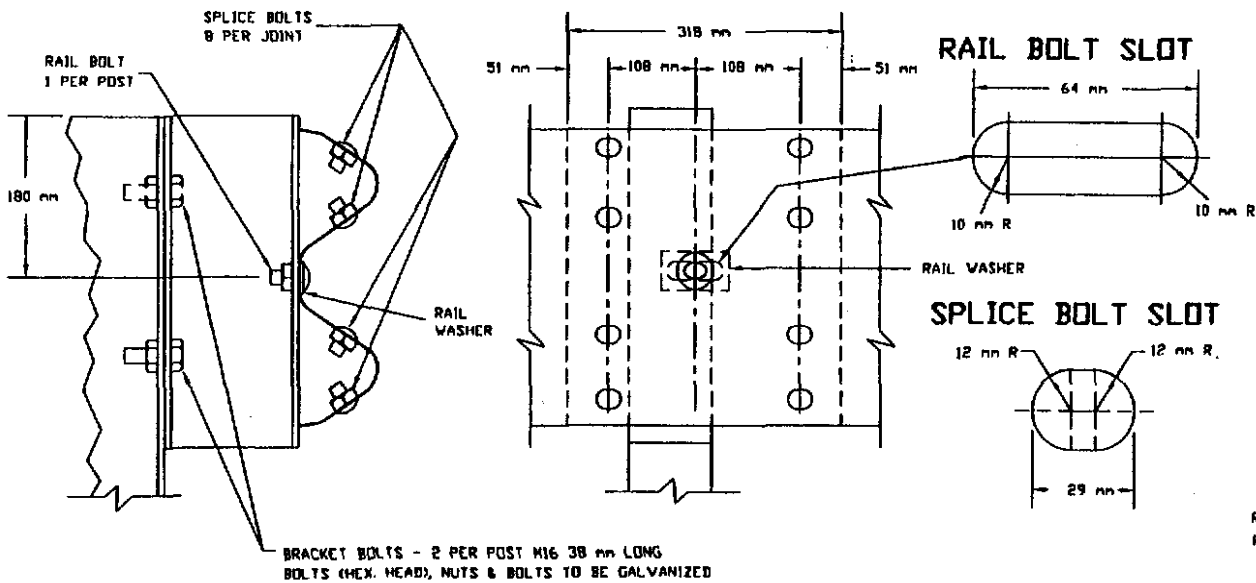
SECTION THROUGH RAIL AT SPLICE



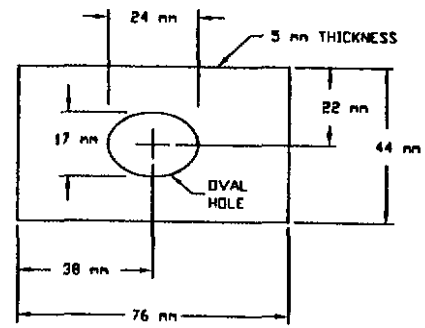
RAIL AND SPLICE BOLTS & NUTS



RAIL SPLICE



RAIL WASHER



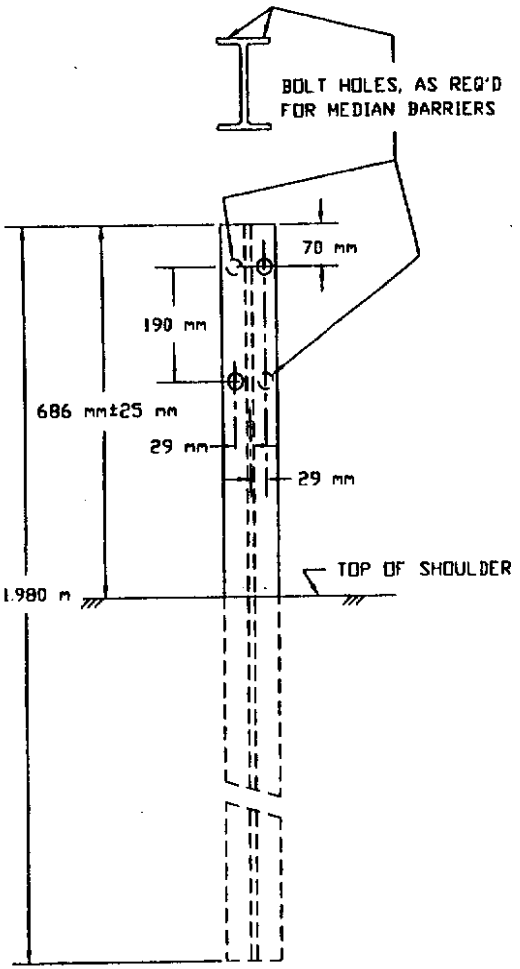
RAIL WASHER TO BE PLACED BETWEEN RAIL AND RAIL BOLT HEAD

MASS HIGHWAY
CONSTRUCTION STANDARDS

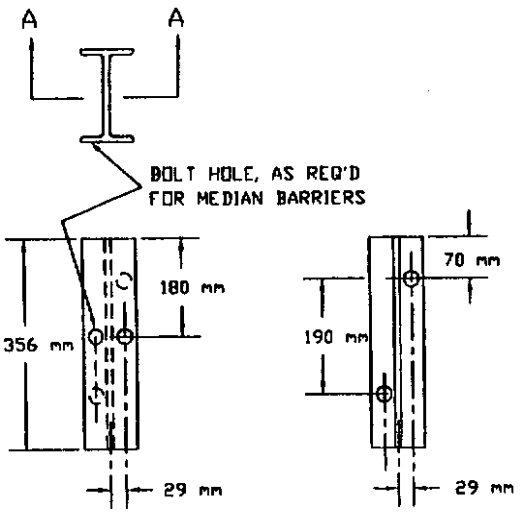
STEEL BEAM HIGHWAY GUARD
TYPE SS – W-RAIL
POST AND OFFSET BRACKET DETAILS

DRAWING NUMBER **401.8.0**

DATE OF ISSUE 9/22/95

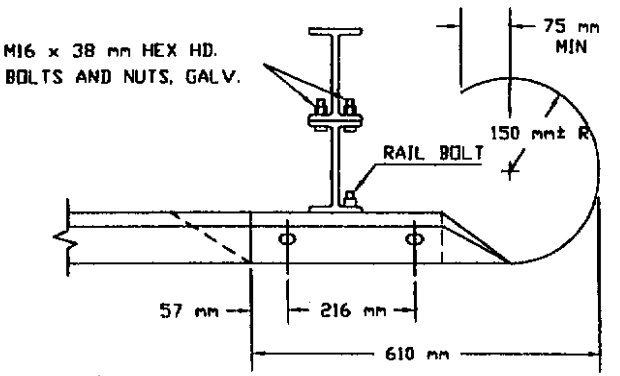


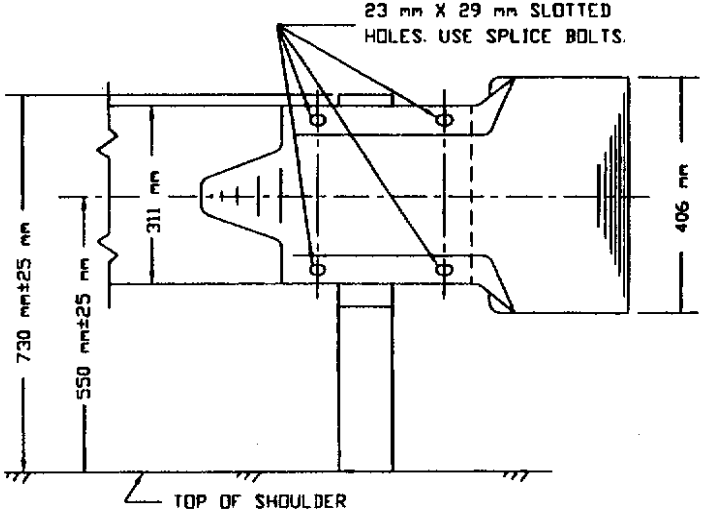
POST



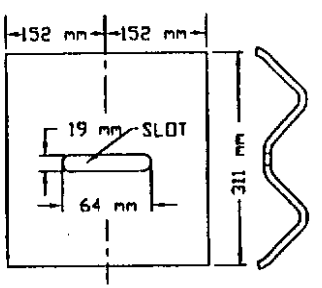
SECTION A-A

OFFSET BRACKET





TERMINAL SECTION



STEEL BACK-UP PLATE
2.7 mm THK

NOTES:

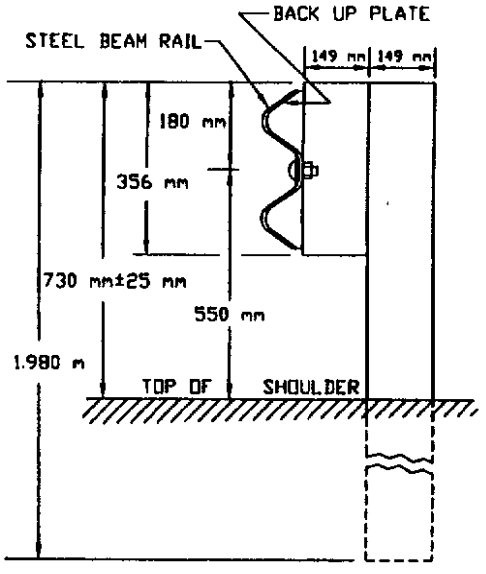
1. POST AND OFFSET BRACKETS TO BE FABRICATED FROM W150 X 13.5
2. POST AND BRACKET BOLT HOLES TO BE 19 mm DIA.
3. BACK UP PLATE TO BE USED ON POSTS WHERE NO SPLICE OCCURS.
4. FABRICATION DIMENSIONS ALSO APPLY TO 'C' POSTS AND BRACKETS.

MASSHIGHWAY
CONSTRUCTION STANDARDS

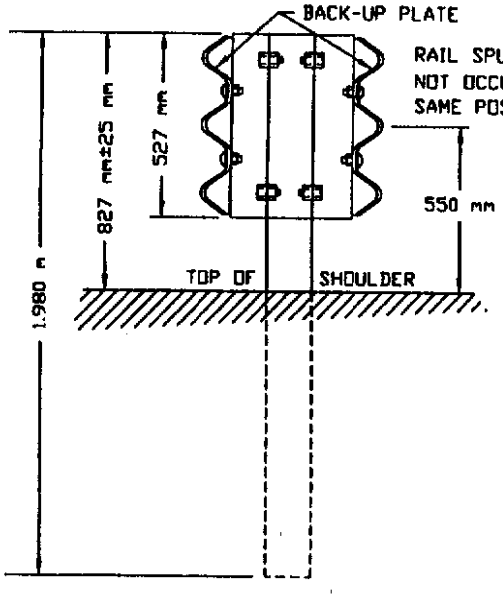
STEEL BEAM GUARD RAIL WITH "C" POSTS

DRAWING NUMBER **401.9.0**

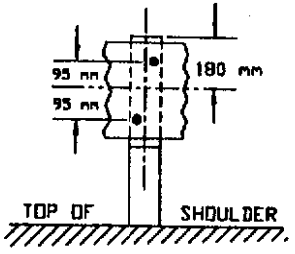
DATE OF ISSUE 9/22/95

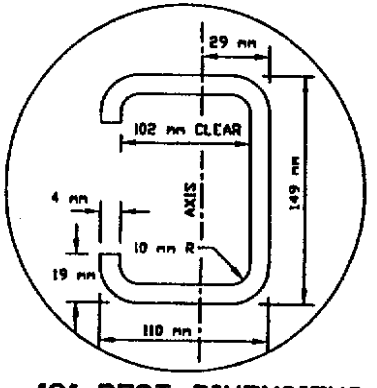


SINGLE FACE *

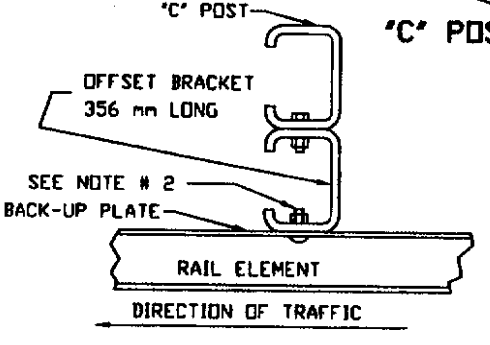


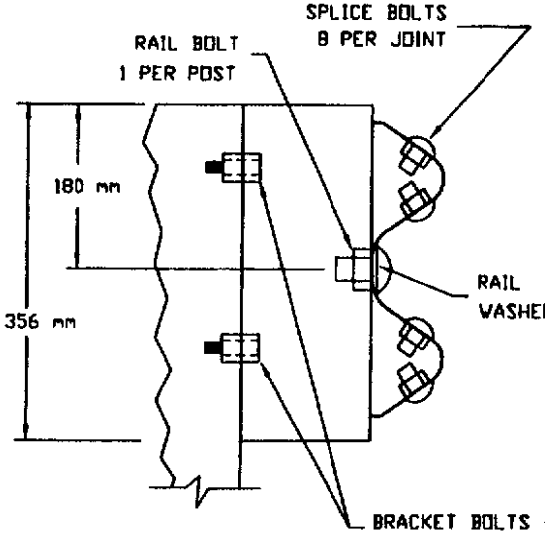
DOUBLE FACE

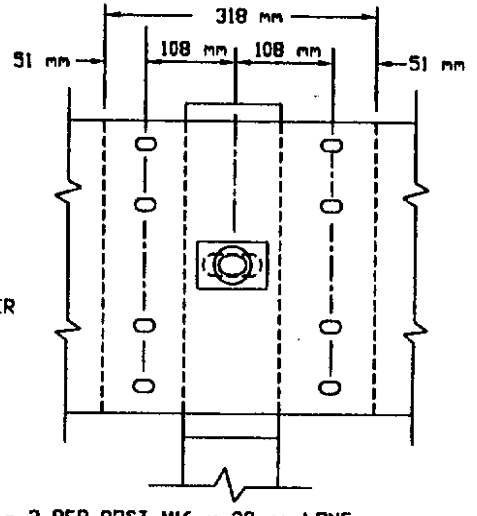




"C" POST DIMENSIONS







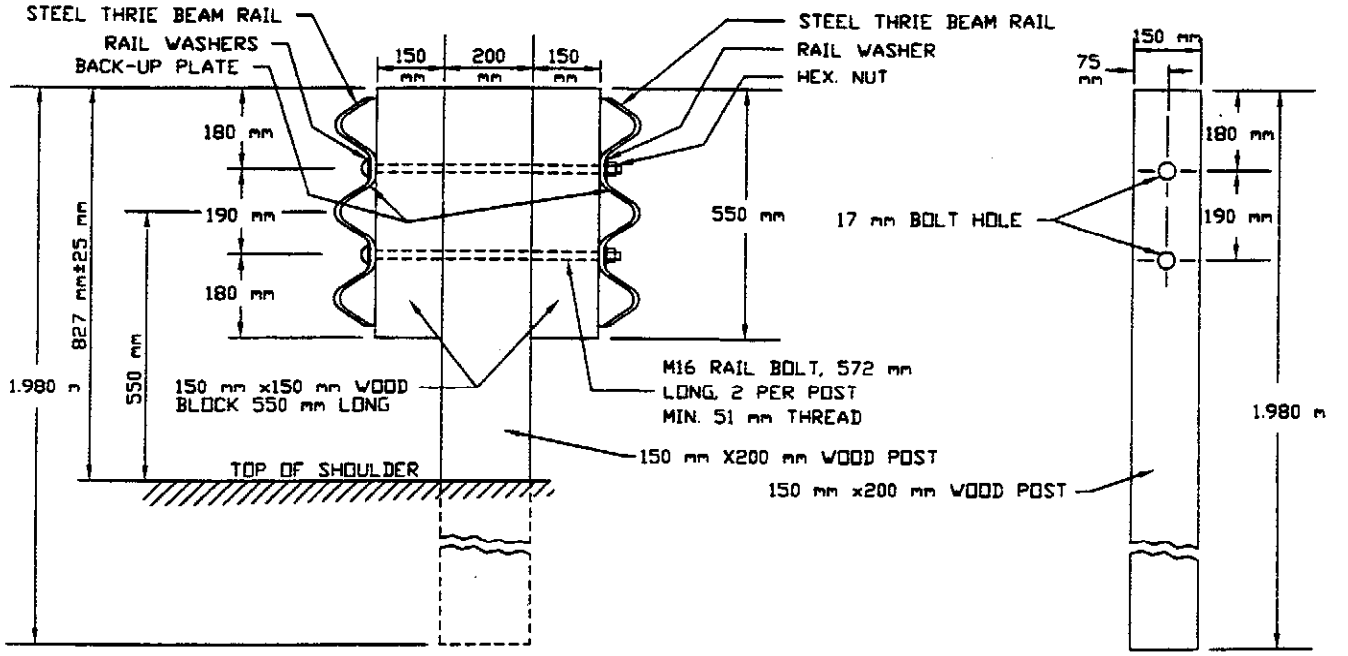
BRACKET BOLTS - 2 PER POST M16 x 38 mm LONG BOLTS (HEX. HEAD), NUT & BOLTS TO BE GALVANIZED.

SPLICING DETAILS

* WHEN PLACED IN MEDIAN CHANGE TO THRIE BEAM, AND CHANGE HEIGHT TO 827 mm±25 mm

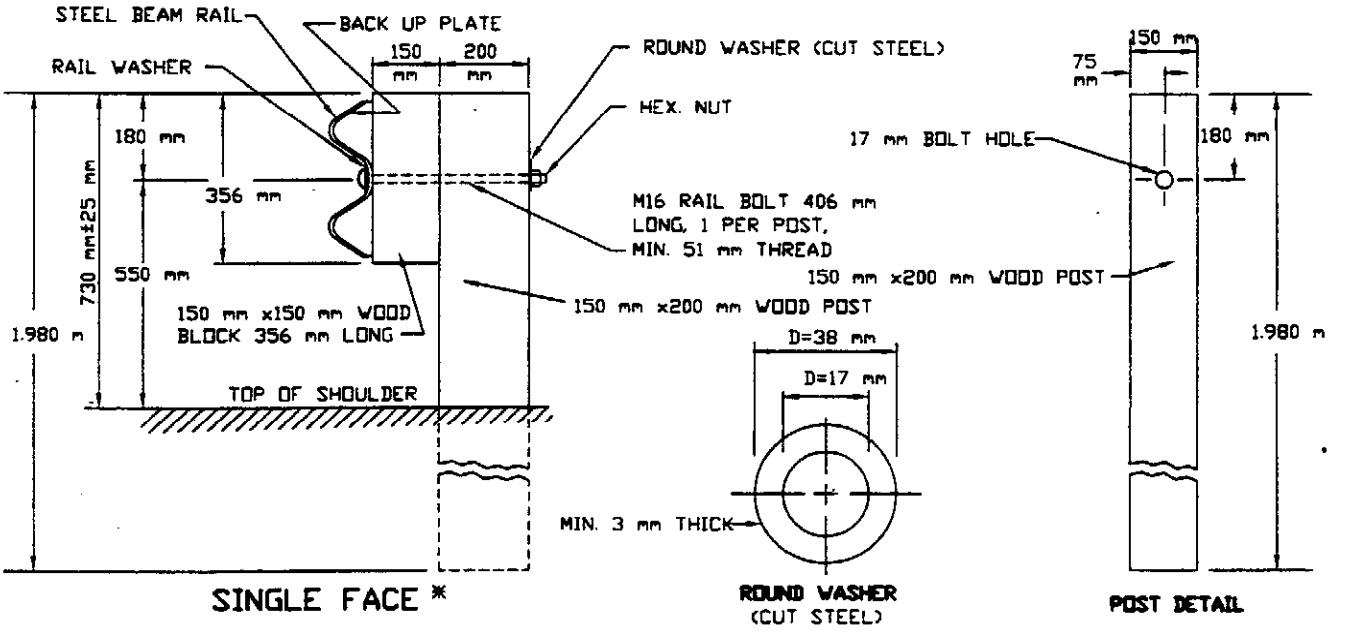
NOTES:

1. ALL MATERIALS AND DIMENSIONS NOT SHOWN HEREIN ARE TO BE SIMILAR TO THE CORRESPONDING ELEMENTS SHOWN FOR STEEL "H" POSTS AND WOOD POSTS.
2. HOLES TO BE LOCATED IN ACCORDANCE WITH DRAWINGS 401.6.0 AND 401.8.0
3. RAIL SPLICES ON DOUBLE FACED HIGHWAY GUARD ARE TO BE STAGGERED, i.e. SPLICES ARE NOT TO BE MADE ON BOTH SIDES OF THE SAME POST.



DOUBLE FACE

POST DETAIL



SINGLE FACE *

ROUND WASHER
(CUT STEEL)

POST DETAIL

* WHEN PLACED IN MEDIAN CHANGE TO THRIE BEAM, AND CHANGE HEIGHT TO 775 mm± 25 mm.

NOTES:

1. POST SPACING, APPROACH END & TRAILING ENDS ARE SIMILAR TO THOSE SHOWN FOR STEEL "H" POSTS.
2. ALL NUTS, BOLTS & WASHERS ARE TO BE GALVANIZED.
3. ALL MATERIALS & DIMENSIONS OF FITTINGS NOT SHOWN ABOVE ARE TO BE SIMILAR TO THE CORRESPONDING ELEMENTS SHOWN FOR STEEL "H" POSTS.
4. TERMINAL SECTIONS FOR DOUBLE FACE & SINGLE FACE GUARD RAIL ARE SHOWN ON DRAWINGS 401.6.0, 401.8.0
5. ALL SPLICES ARE TO BE MADE AT POSTS.
6. FOR THE TYPE OF WOOD & WOOD TREATMENT, OTHER MATERIALS & METHODS OF CONST., SEE STANDARD SPECIFICATIONS & SPECIAL PROVISIONS.
7. FOR DETAILS OF SLOT IN BACK-UP PLATE SEE DRAWINGS 401.7.0 & 401.8.0
8. BACK-UP PLATE IS PLACED BEHIND RAIL ELEMENTS AT INTERMEDIATE POSTS, i.e. NON SPLICE LOCATION.
9. STEEL POSTS ARE TO BE SUBSTITUTED AT THE SAME BID PRICE, FOR CERTAIN WOOD POSTS IN A WOOD POST RUN WHEN CEMENT CONCRETE EMBEDMENT IS REQUIRED.

MASS HIGHWAY
CONSTRUCTION STANDARDS

STEEL BEAM GUARD RAIL WITH WOOD POST

DATE OF ISSUE
9/22/95

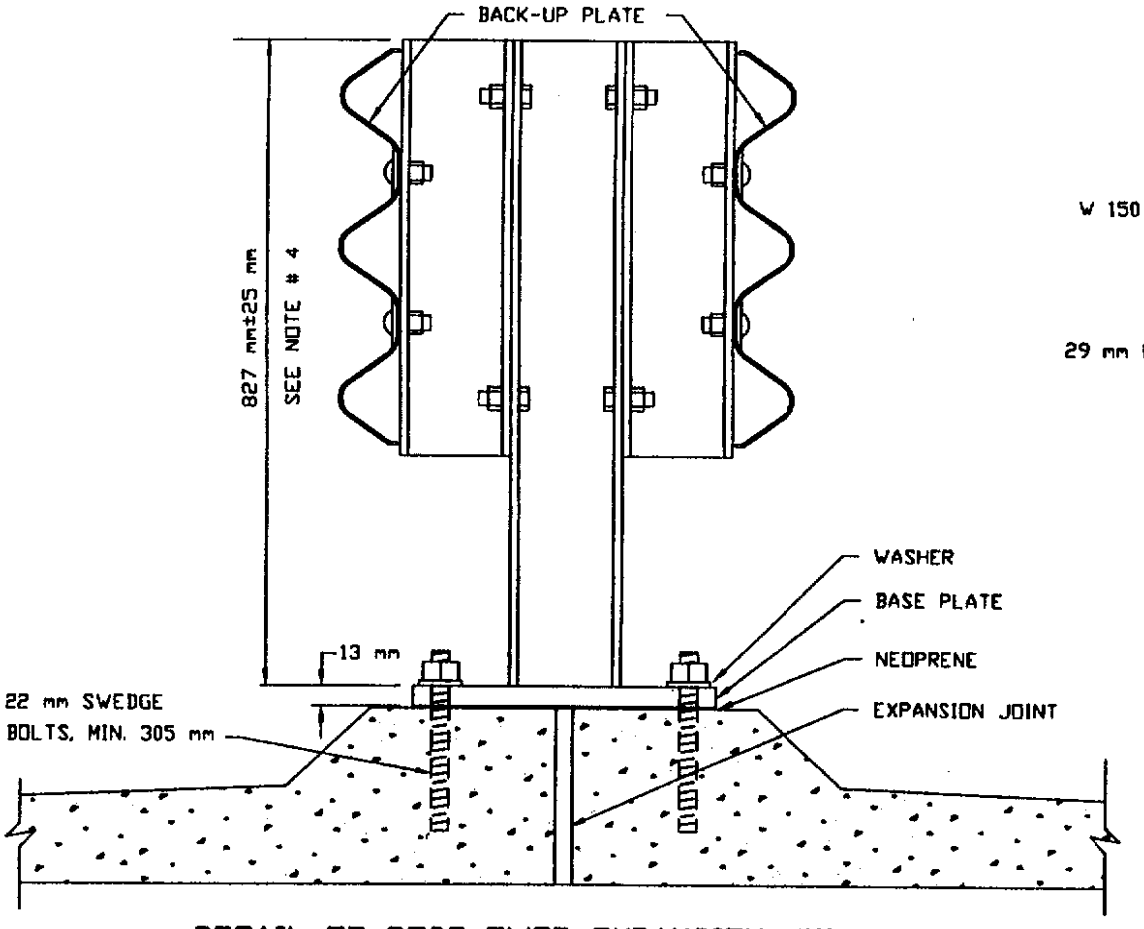
DRAWING NUMBER
401.10.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

SPECIAL BASE ANCHORAGE FOR HIGHWAY GUARD INSTALLATION ON CONCRETE

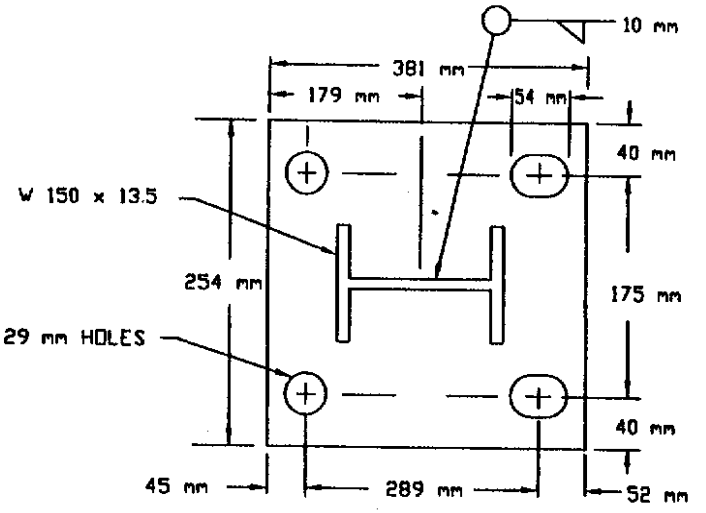
DATE OF ISSUE 9/22/95

DRAWING NUMBER **401.11.0**

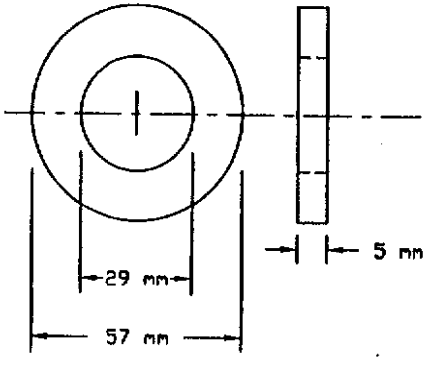


DETAIL OF POST OVER EXPANSION JOINT

SEE NOTE # 5 WHEN THERE IS NO EXPANSION JOINT.



DETAIL OF BASE PLATE

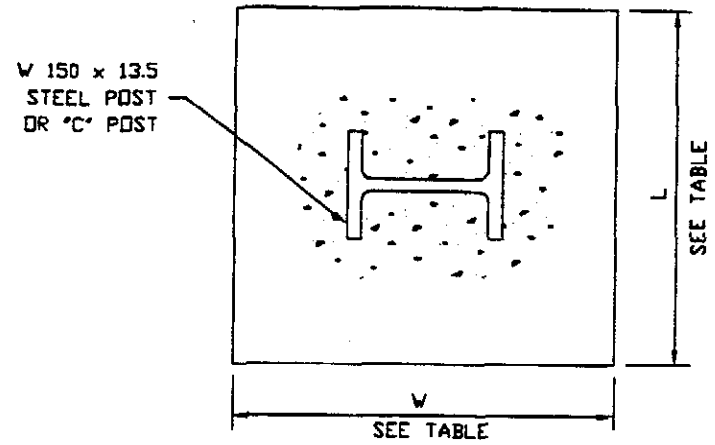


DETAIL OF WASHER

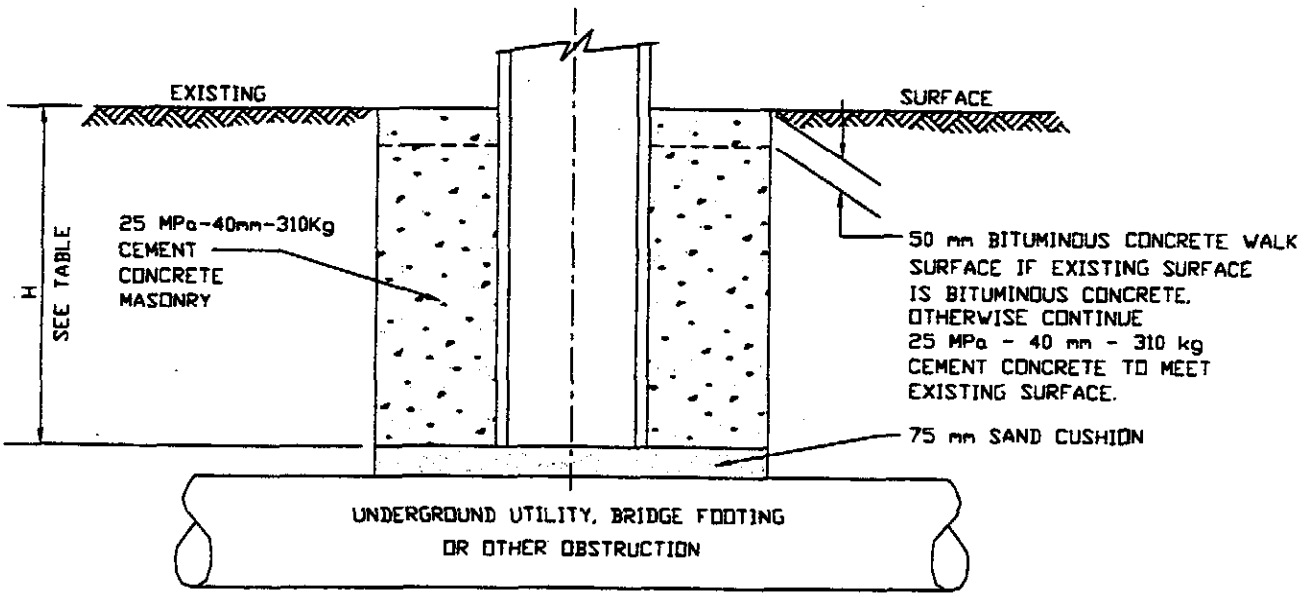
GALVANIZED

NOTES:

1. SWEDGE BOLTS, NUTS AND WASHERS ARE TO BE GALVANIZED.
2. HOLES FOR SWEDGE BOLTS SHALL BE 254 mm DEEP. SWEDGE BOLTS TO BE SET IN EPOXY RESIN, AS APPROVED BY THE ENGINEER.
3. BASE PLATE IS TO BE SET ON 2 mm NEOPRENE.
4. DETAILS OF HIGHWAY GUARD ARE SHOWN ON DRAWINGS 401.1.0, 401.5.0 & 401.6.0
5. THE BASE PLATE AND CONSTRUCTION METHOD SHOWN ABOVE ARE ALSO USED WHEN THERE ARE NO EXPANSION JOINTS IN THE CEMENT CONCRETE.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR ALL FIELD MEASUREMENTS.
7. FOR BACK-UP PLATE DETAIL SEE DRAWING 401.6.0



PLAN



ELEVATION

HEIGHT OF EXISTING SURFACE ABOVE TOP OF SAND CUSHION	DIMENSION OF CONCRETE ENVELOPE		
	H HEIGHT OF SURFACE ABOVE SAND CUSHION	W (mm)	L (mm)
305 mm TO 457 mm	VARIES 305 mm TO 457 mm	762 mm	762 mm
457 mm TO 762 mm	VARIES 457 mm TO 762 mm	610 mm	610 mm
OVER 762 mm	762 mm	457 mm	457 mm

NOTE:

1. OFFSET BRACKETS ARE TO BE INSTALLED AND RAILS ARE TO BE MOUNTED AS SHOWN ON DRAWINGS 401.1.0 AND 401.5.0 - 401.9.0

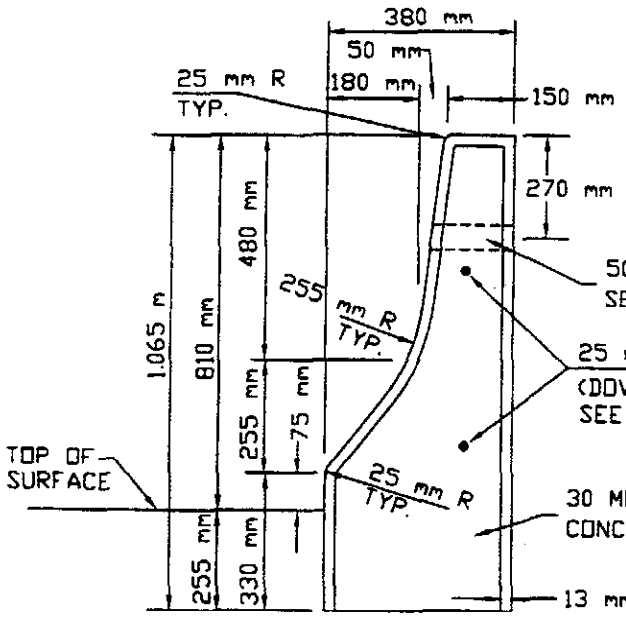
MASS HIGHWAY CONSTRUCTION STANDARDS

MODIFIED GUARD RAIL POST INSTALLATION

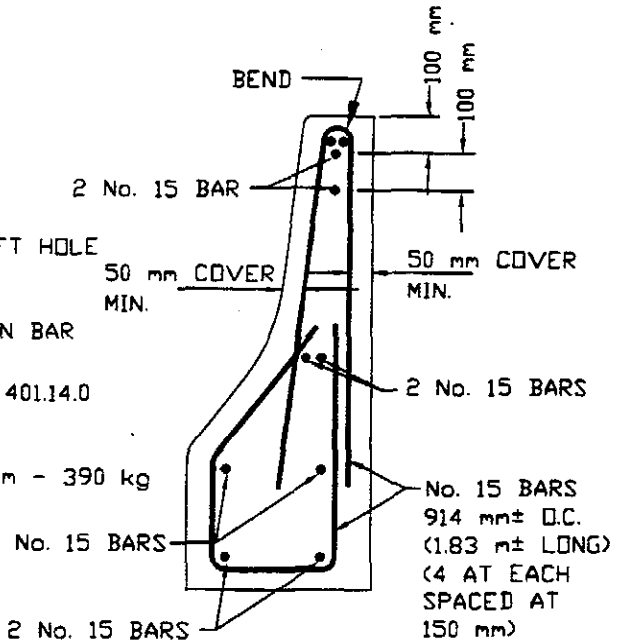
WHERE STANDARD IMBEDMENT IS NOT FEASIBLE

DATE OF ISSUE 9/22/95

DRAWING NUMBER **401.12.0**

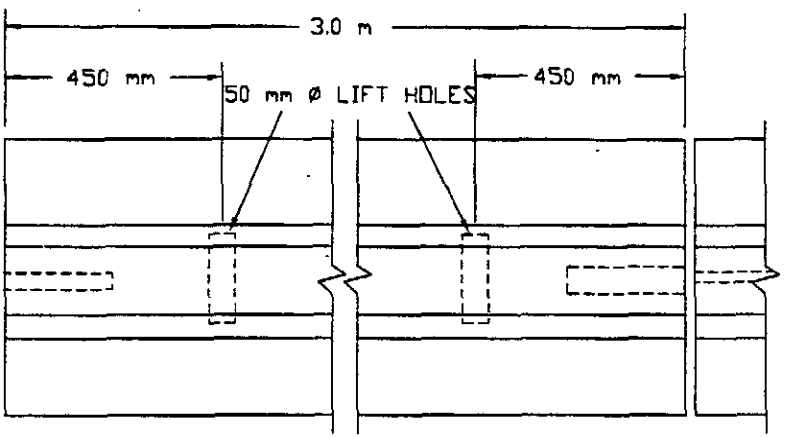


END ELEVATION *



REINFORCING DIAGRAM

SEE DRAWING NUMBER 401.13.1



LIFT HOLES

* FOR FOUNDATION DETAILS SEE DRAWING 401.15.0
FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD SEE LATEST STANDARD SPECIFICATIONS.
FOR BARRIER DETAILS ON STRUCTURES, SEE BRIDGE MANUAL.

NOTES:

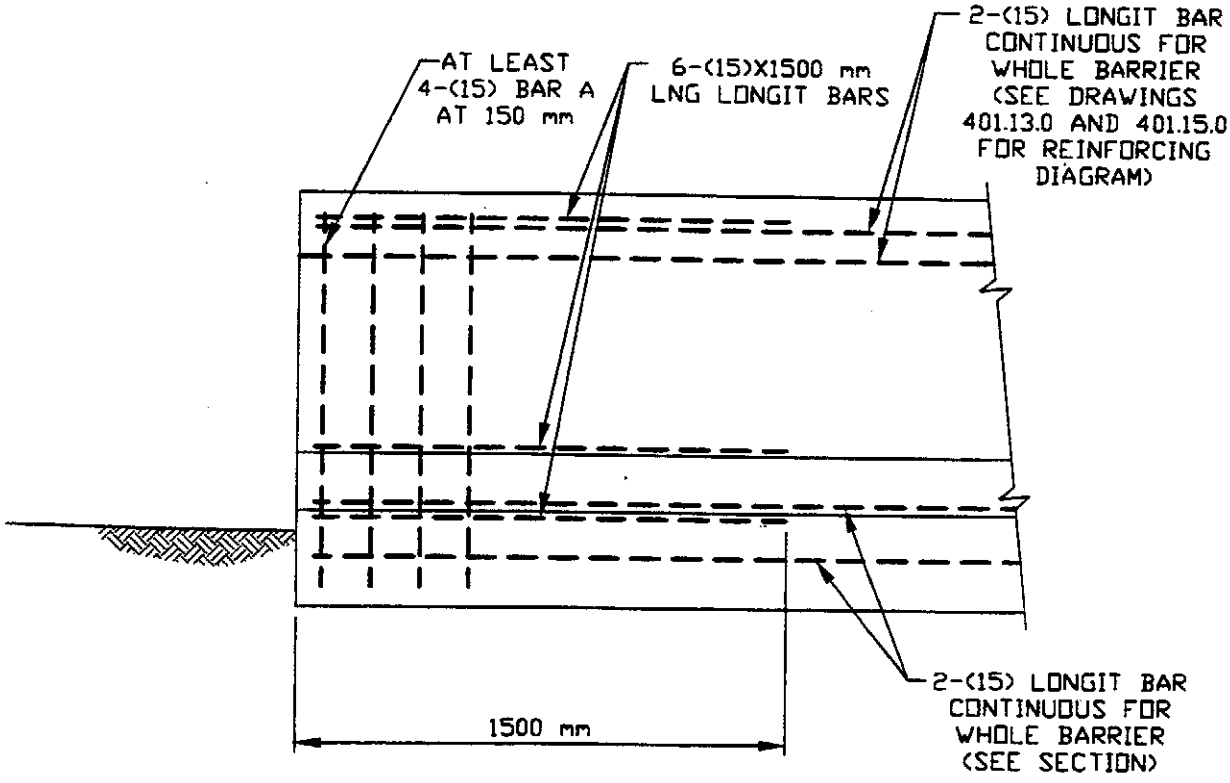
1. THE MAXIMUM OPENING BETWEEN SECTIONS TO BE NO GREATER THAN 6 mm.
2. A 13 mm PREMOULDED EXPANSION JOINT FILLER TO BE PLACED EVERY 12.0 m.

MASS HIGHWAY
CONSTRUCTION STANDARDS

PRE-CAST CONCRETE JERSEY MEDIAN BARRIER SINGLE FACE

DATE OF ISSUE
9/22/95

DRAWING NUMBER
401.13.0



MASS HIGHWAY
CONSTRUCTION
STANDARDS

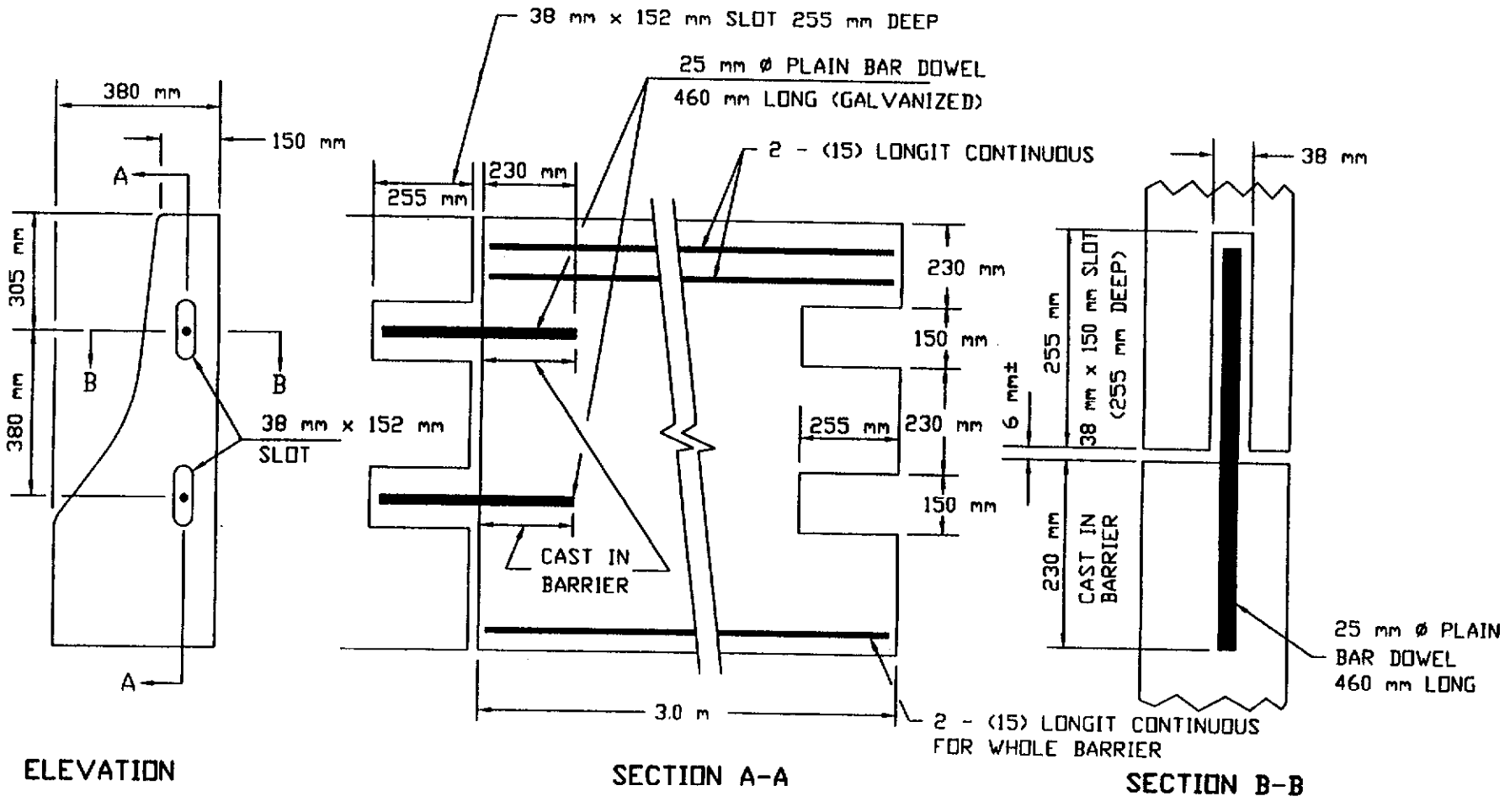
PRE-CAST CONCRETE
JERSEY MEDIAN BARRIER
REINFORCEMENT DETAILS

DATE OF ISSUE
9/22/95

DRAWING NUMBER
401.13.1

MASS HIGHWAY
CONSTRUCTION STANDARDS

PRE-CAST CONCRETE MEDIAN BARRIER DOWEL DETAILS

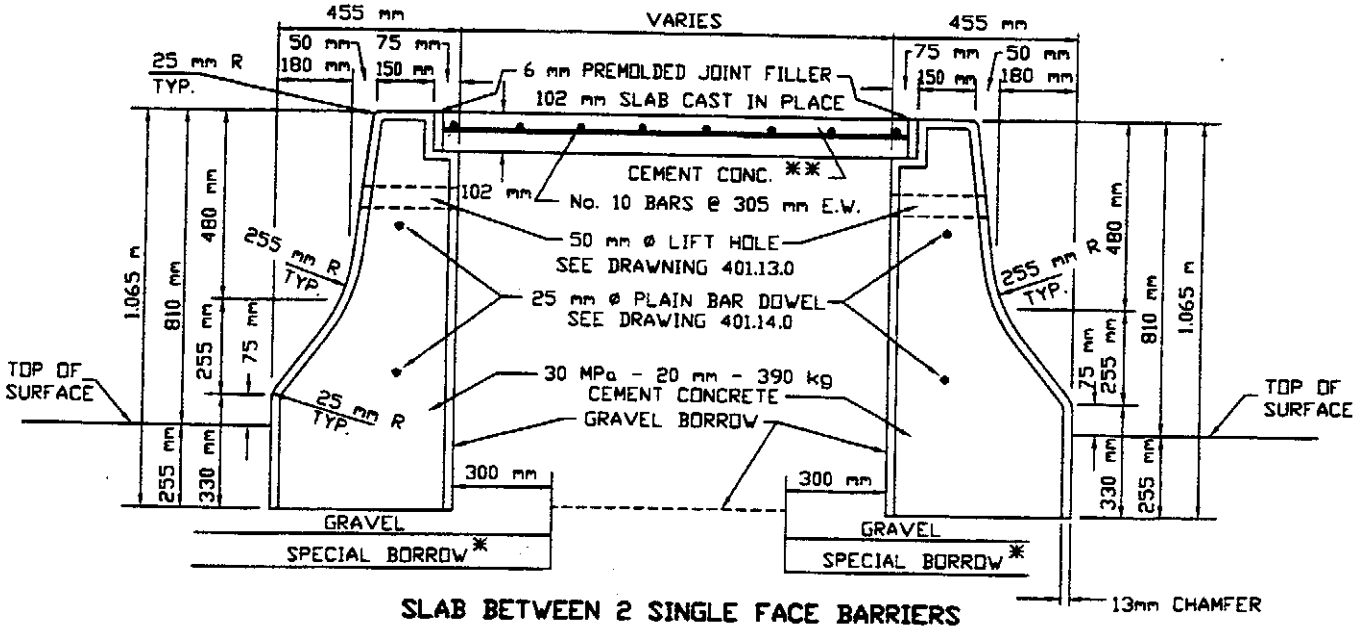


NOTES:

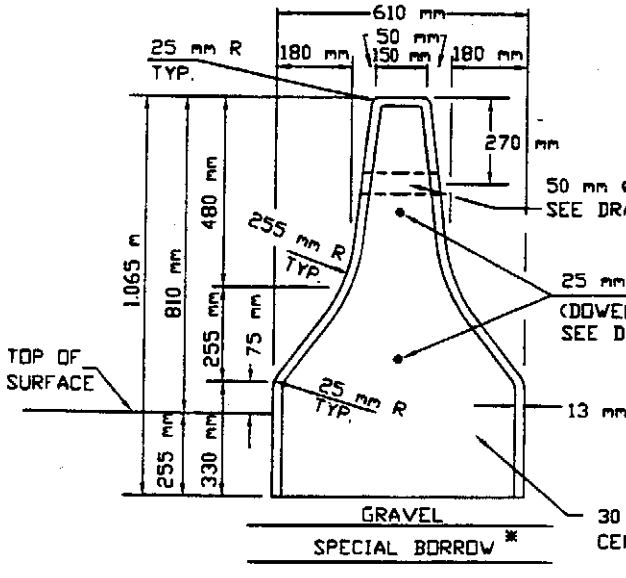
1. DOWELS TO BE GALVANIZED.
2. FOR ADDITIONAL DETAILS SEE DRAWING 401.13.0
3. FOR BARRIER DETAILS ON STRUCTURES, SEE BRIDGE MANUAL.

DATE OF ISSUE 9/22/95

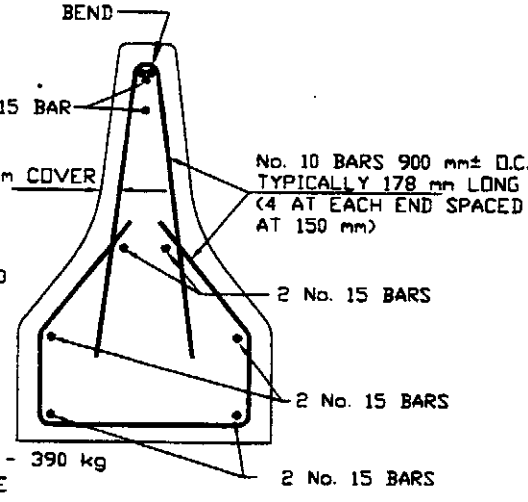
DRAWING NUMBER **401.14.0**



SLAB BETWEEN 2 SINGLE FACE BARRIERS



DOUBLE FACE BARRIER



REINFORCING STEEL
DOUBLE FACE
SEE DRAWING 401.13.1

* SAME DEPTH AS UNDER ROADWAY.
FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD SEE LATEST STANDARD SPECIFICATIONS.
FOR BARRIER DETAILS ON STRUCTURES, SEE BRIDGE MANUAL.

** BARRIER CAP BUILT USING 30 MPa - 40 mm - 335 kg CEMENT CONCRETE.

NOTES:

1. UNLESS OTHERWISE SPECIFIED, BARRIER WALLS ARE TO BE CONSTRUCTED IN 3.0 m SECTIONS.
2. THE MAXIMUM OPENING BETWEEN ADJACENT SECTIONS OF BARRIER WALL TO BE NO GREATER THAN 6 mm.
3. A 13 mm PREMOLDED JOINT FILLER IS TO BE PLACED AT 12.0 m INTERVALS OF THE MEDIAN BARRIER AND THE CAP SEPARATOR.

MASS HIGHWAY
CONSTRUCTION STANDARDS

PRE-CAST CONCRETE MEDIAN BARRIER WITH CONCRETE CAP SEPARATOR

DATE OF ISSUE
9/22/95

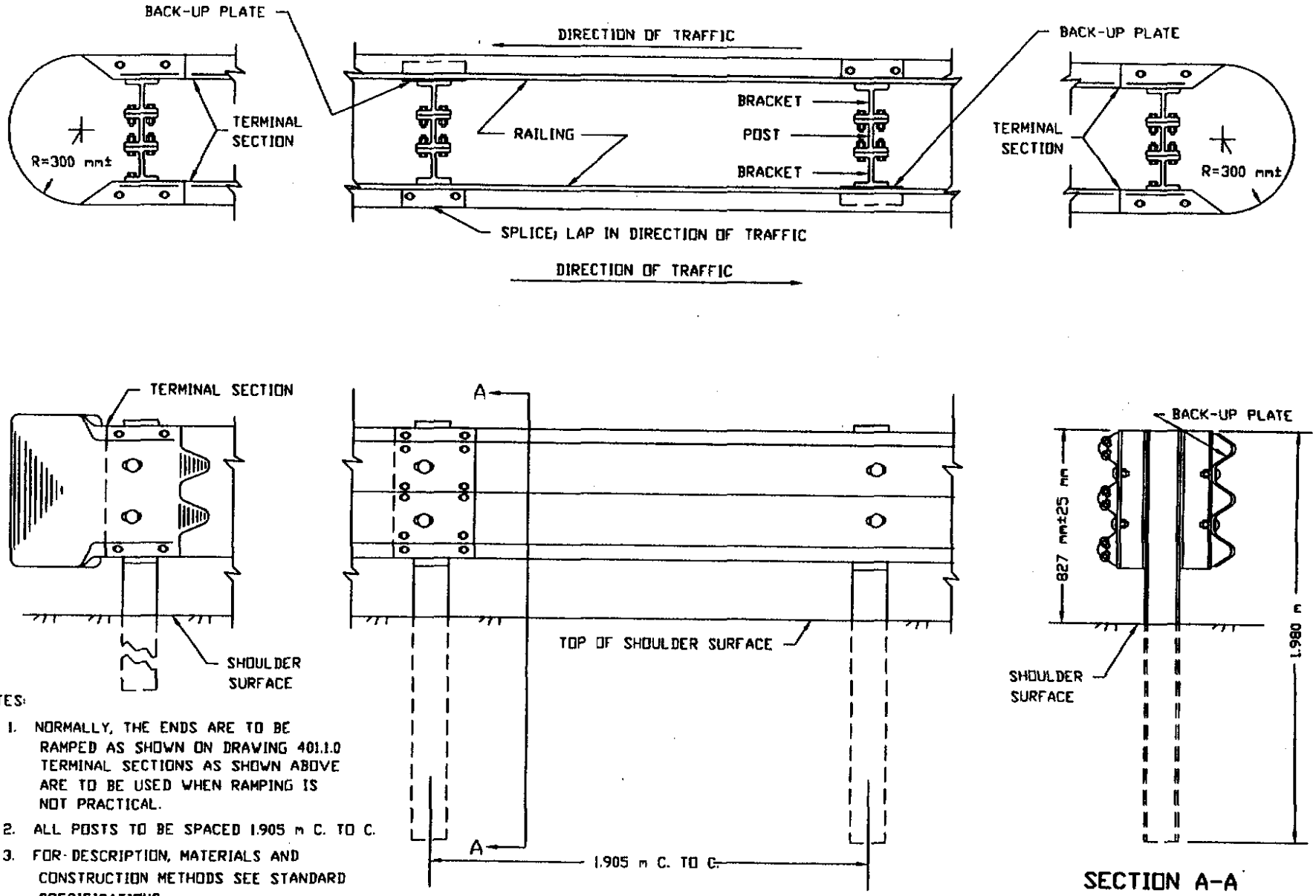
DRAWING NUMBER
401.15.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

STEEL THRIE BEAM HIGHWAY GUARD
TYPE SS
MEDIAN-BARRIER

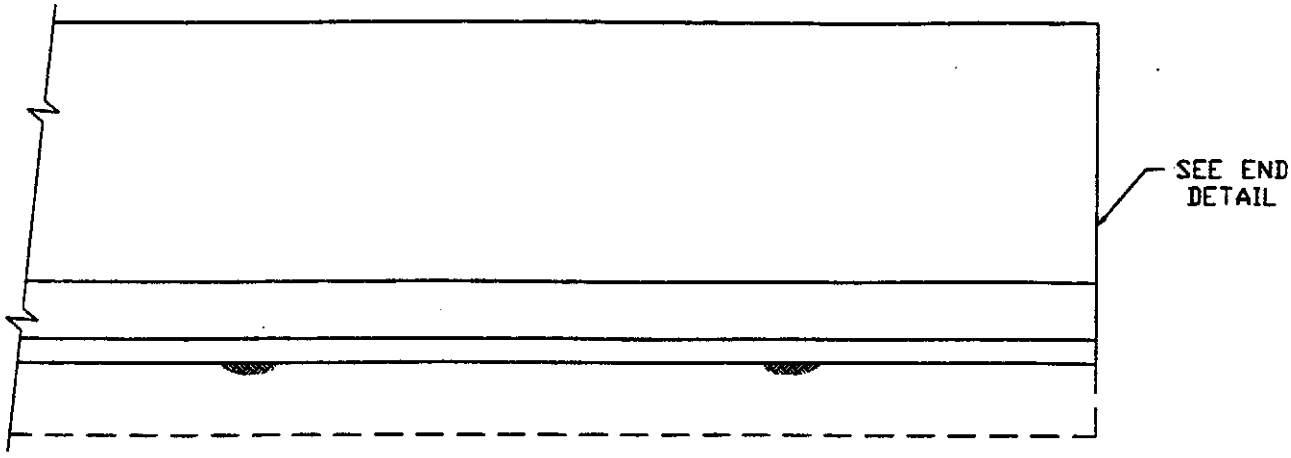
DATE OF ISSUE 9/22/95

DRAWING NUMBER **401.16.0**

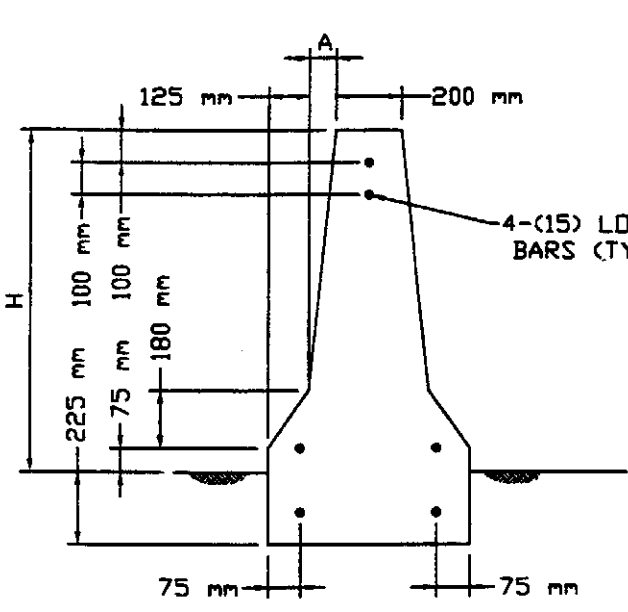


NOTES:

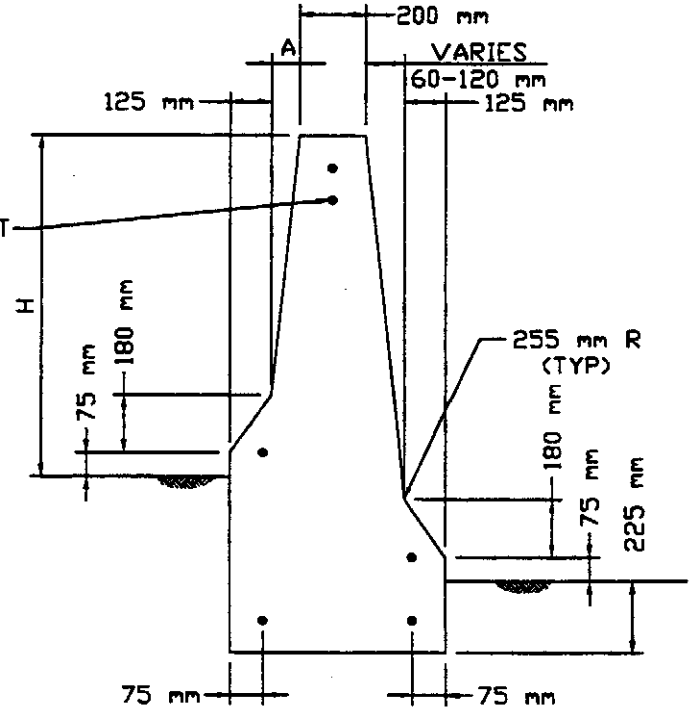
1. NORMALLY, THE ENDS ARE TO BE RAMPED AS SHOWN ON DRAWING 401.1.0 TERMINAL SECTIONS AS SHOWN ABOVE ARE TO BE USED WHEN RAMPING IS NOT PRACTICAL.
2. ALL POSTS TO BE SPACED 1.905 m C. TO C.
3. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.
4. FOR DETAILS OF BARRIER COMPONENTS SEE DRAWINGS 401.5.0 AND 401.6.0
5. RAIL SPLICES ON DOUBLE FACED HIGHWAY GUARD ARE TO BE STAGGERED, i.e. SPLICES ARE NOT TO BE MADE ON BOTH SIDES OF THE SAME POST.



ELEVATION



SECTION



SECTION

SYSTEM	A	B
NORMAL	60	810
TALL	85	1070

NOTES:

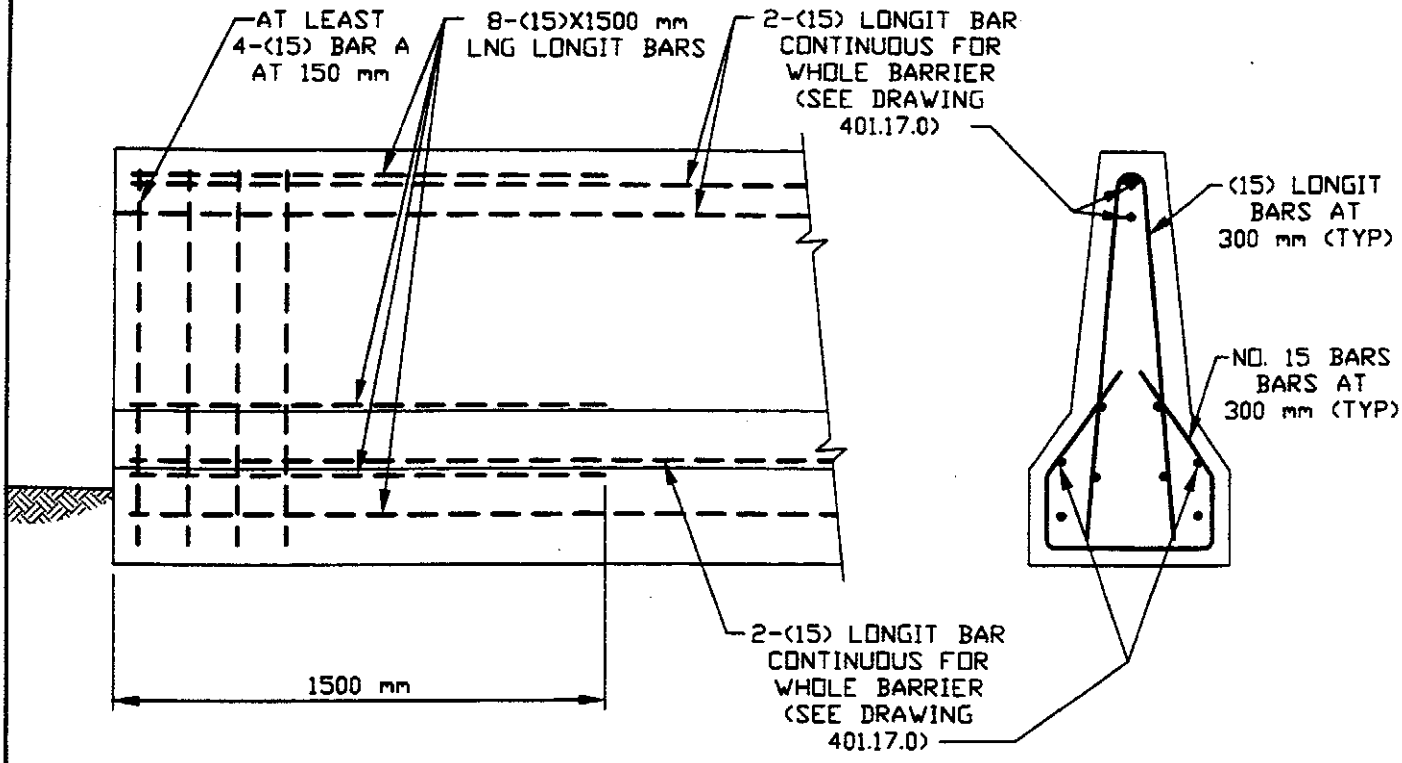
1. ALL EDGES SHALL BE ROUNDED WITH A 25 mm RADIUS EXCEPT AS SHOWN
2. FOR DOWELL CONNECTION DETAILS SEE DWG. NO. 401.14.0.

MASS HIGHWAY
CONSTRUCTION
STANDARDS

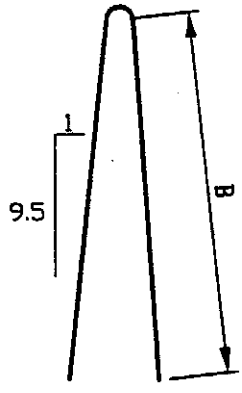
F-SHAPE
MEDIAN BARRIER

DATE OF ISSUE
9/22/95

DRAWING NUMBER
401.17.0



ANCHORAGE DETAIL



SYSTEM	B
NORMAL	970
TALL	1250

BAR A (15)

NOTES:

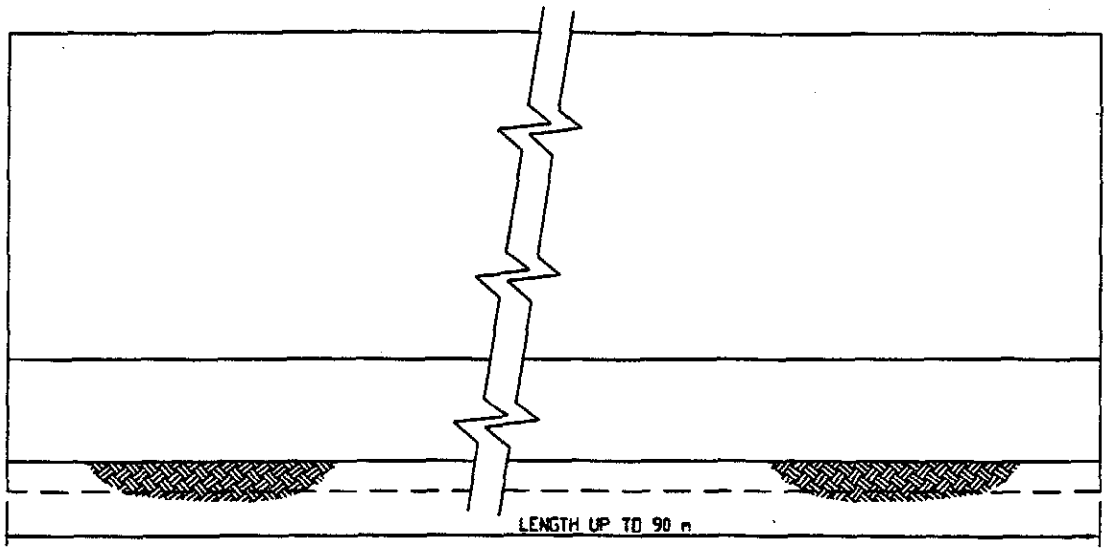
1. THE TOTAL LENGTH OF THE BARRIER SHALL BE LESS THAN 60000 mm. A LENGTH OF 6000 mm IS THE MOST COMMON.
2. USE MINIMUM COVER OF 40 mm.
3 MATERIAL IS 30 MPa - 20 mm - 390 kg CONCRETE

MASS HIGHWAY
CONSTRUCTION STANDARDS

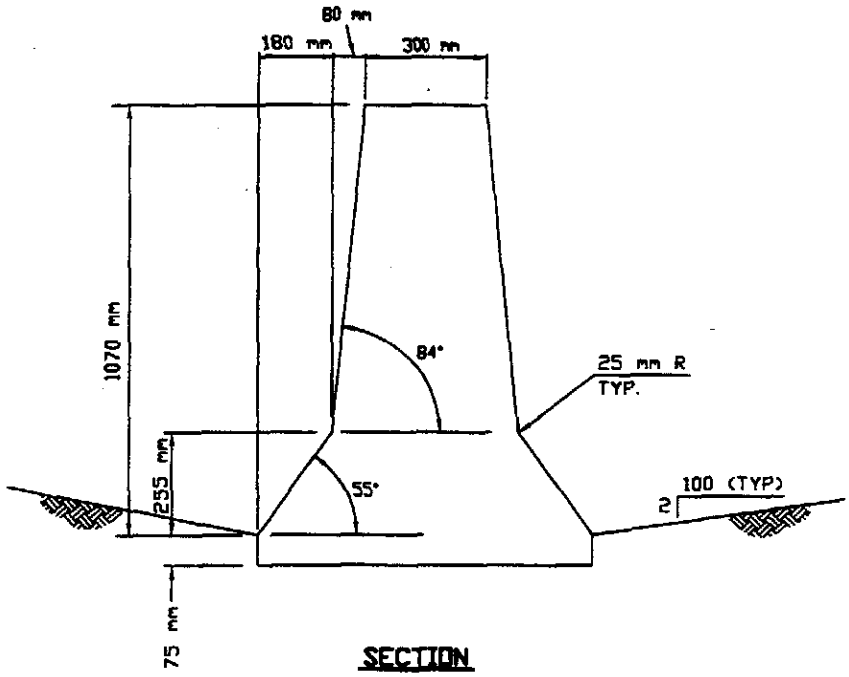
F-SHAPE MEDIAN BARRIER

DATE OF ISSUE
9/22/95

DRAWING NUMBER
401.18.0



ELEVATION



SECTION

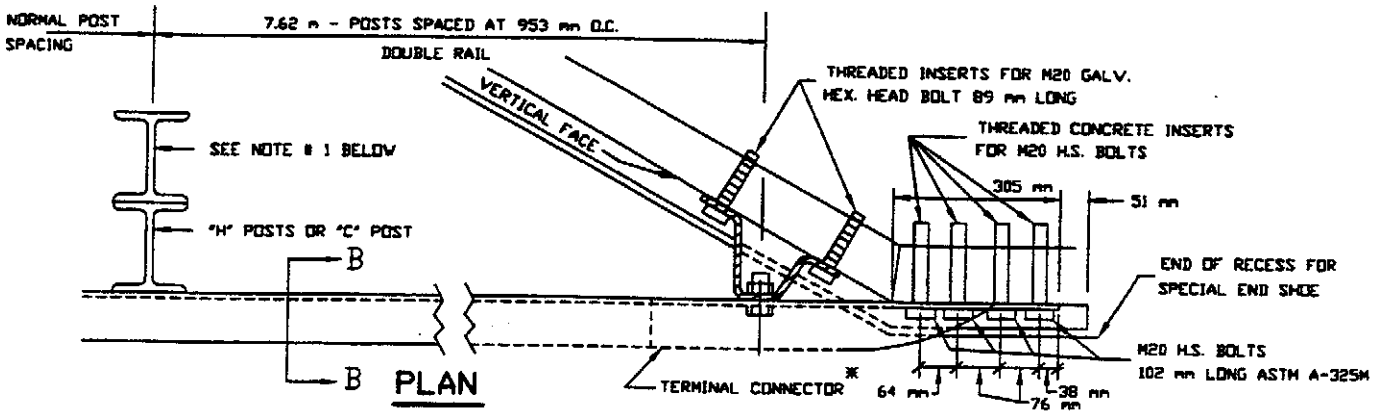
NOTES:
1. ALL EDGES SHALL BE ROUNDED WITH A 25 mm RADIUS EXCEPT AS SHOWN.
2. THIS BARRIER DOES USE REINFORCEMENT STEEL.
3. BARRIER RESTS DIRECTLY ON COMPACTED GRAVEL. 75 mm THICK PAVEMENT OR COMPACTED GRAVEL LAYER PROVIDES LATERAL SUPPORT TO THIS BARRIER.

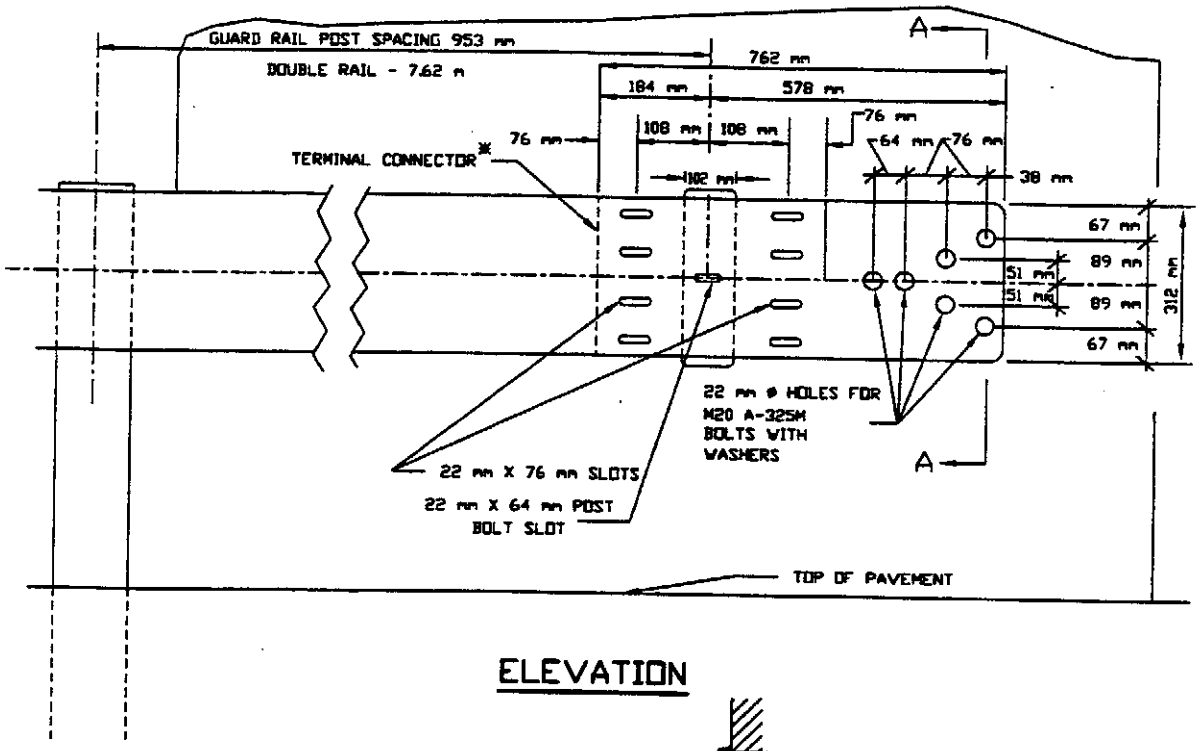
MASS HIGHWAY CONSTRUCTION STANDARDS

PRE-CAST CONCRETE TALL-WALL MEDIAN BARRIER

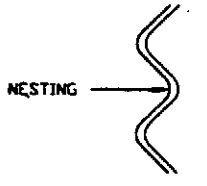
DATE OF ISSUE 9/22/95

DRAWING NUMBER **401.19.0**

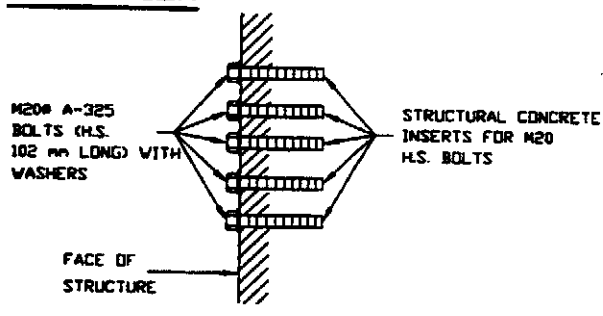




ELEVATION



SECTION B-B
2 RAILS



SECTION A-A

* SEE BRIDGE STANDARDS FOR DETAILS; LAP IN DIRECTION OF TRAVEL.

NOTE:

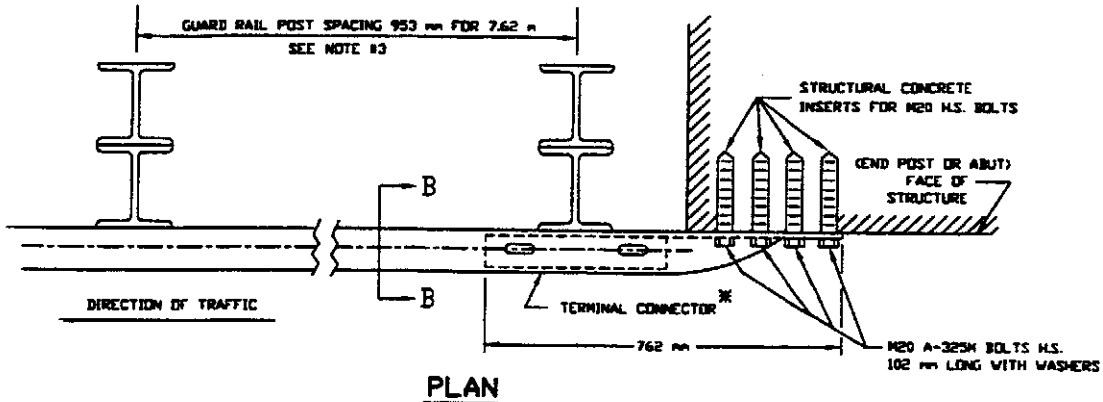
1. CONSTRUCTION DETAILS SHOWN ALSO APPLY TO CHARLEY (C) POST INSTALLATIONS.
2. THE DOUBLE RAIL ELEMENT IS TO CONSIST OF NESTING TWO (2) 2.7 mm THK RAIL ELEMENTS FOR A DISTANCE OF 7.62 m. THE SHORT RAIL (7.62 m) IS TO BE NESTED BEHIND THE CONTINUOUS RAIL.
3. BACK UP PLATE NOT REQUIRED WHERE RAIL IS TO BE NESTED.
4. BRACKET WILL BE USED ON NEW STRUCTURES WITH FLARED END POST OTHERWISE THE STANDARD GUARD RAIL POST WILL BE USED.

MASS HIGHWAY CONSTRUCTION STANDARDS

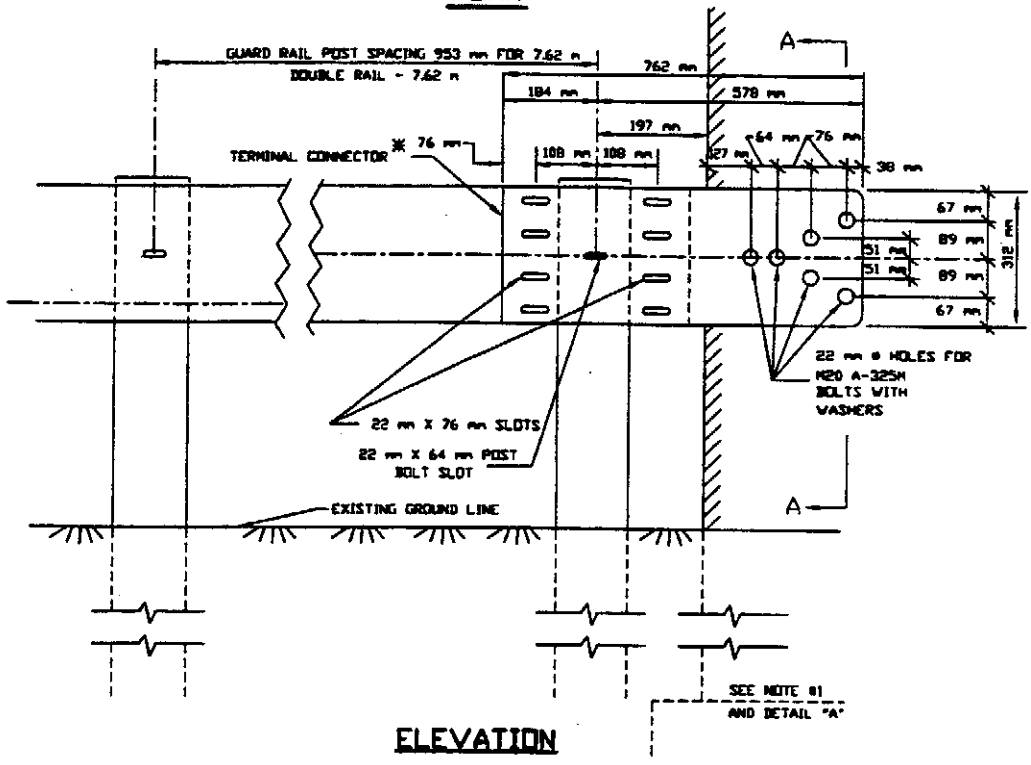
METHOD OF PLACING GUARD RAIL TERMINAL CONNECTORS ON PROP. BRIDGE STRUCTURES
(LEADING AND TRAILING ENDS W-RAIL)

DATE OF ISSUE 9/22/95

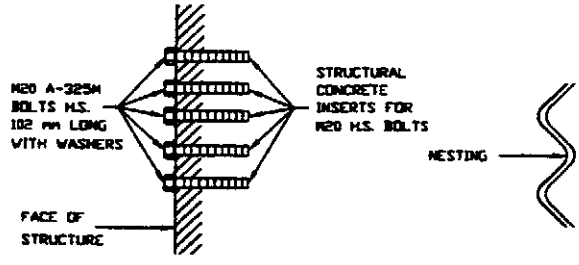
DRAWING NUMBER **402.1.0**



PLAN

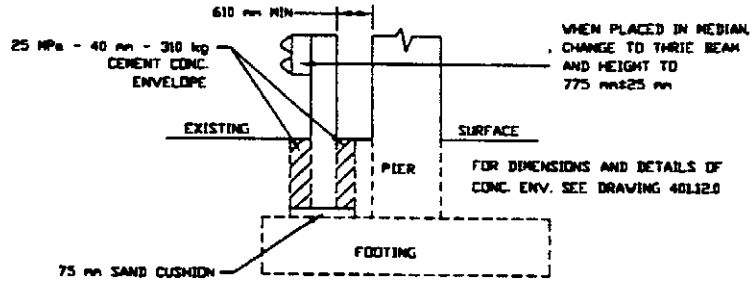


ELEVATION



SECTION A-A

SECTION B-B
2 RAILS



DETAIL "A"
SEE NOTE #1

* SEE BRIDGE STANDARDS FOR DETAILS; LAP IN DIRECTION OF TRAVEL.

NOTES:

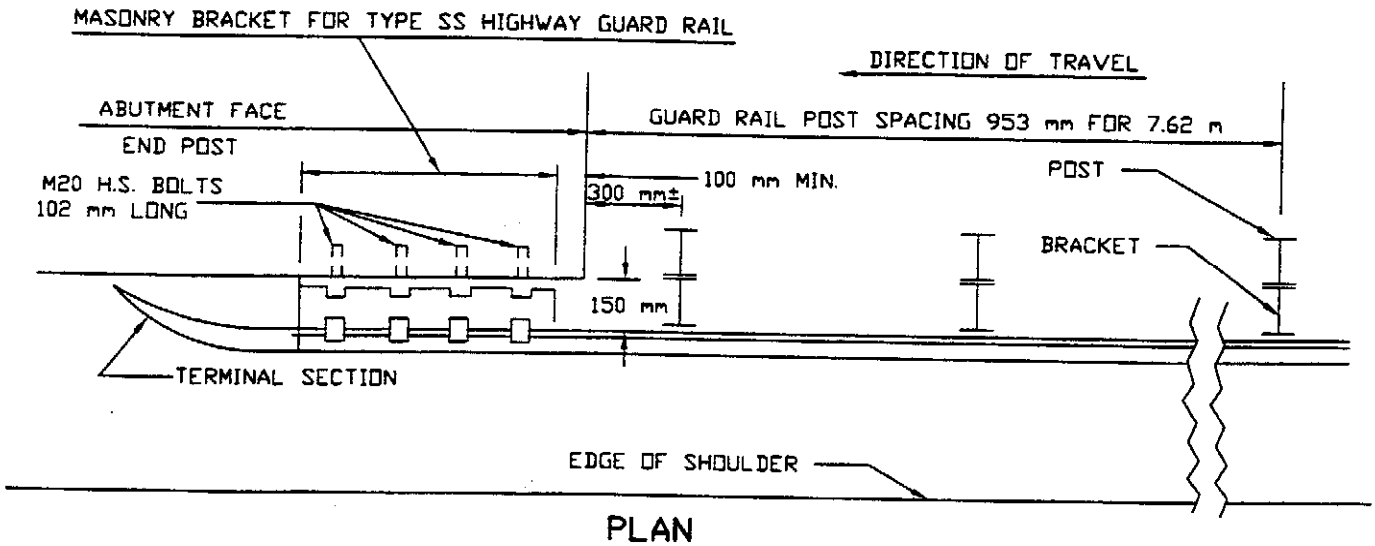
1. WHEN THE HIGHWAY GUARD POST FALLS ON THE FOOTING OF THE STRUCTURE AND THE DISTANCE FROM THE SURFACE TO THE TOP OF THE FOOTING IS LESS THAN 991 mm THE POST SHALL BE CUT AND SET ON THE FOOTING IN A CEMENT CONCRETE ENVELOPE AS SHOWN IN DETAIL "A".
2. CONSTRUCTION DETAILS SHOWN ALSO APPLY TO WOOD AND CHARLEY (C) POST INSTALLATIONS.
3. THE DOUBLE RAIL ELEMENT IS TO CONSIST OF NESTING TWO (2) 2.7 mm THK RAIL ELEMENTS FOR A DISTANCE OF 7.62 m, THE SHORT RAIL (7.62 m) IS TO BE NESTED BEHIND THE CONTINUOUS RAIL, SEE SECTION B-B.
4. BACK UP PLATE NOT REQUIRED WHERE RAIL IS TO BE NESTED.

MASS HIGHWAY
CONSTRUCTION STANDARDS

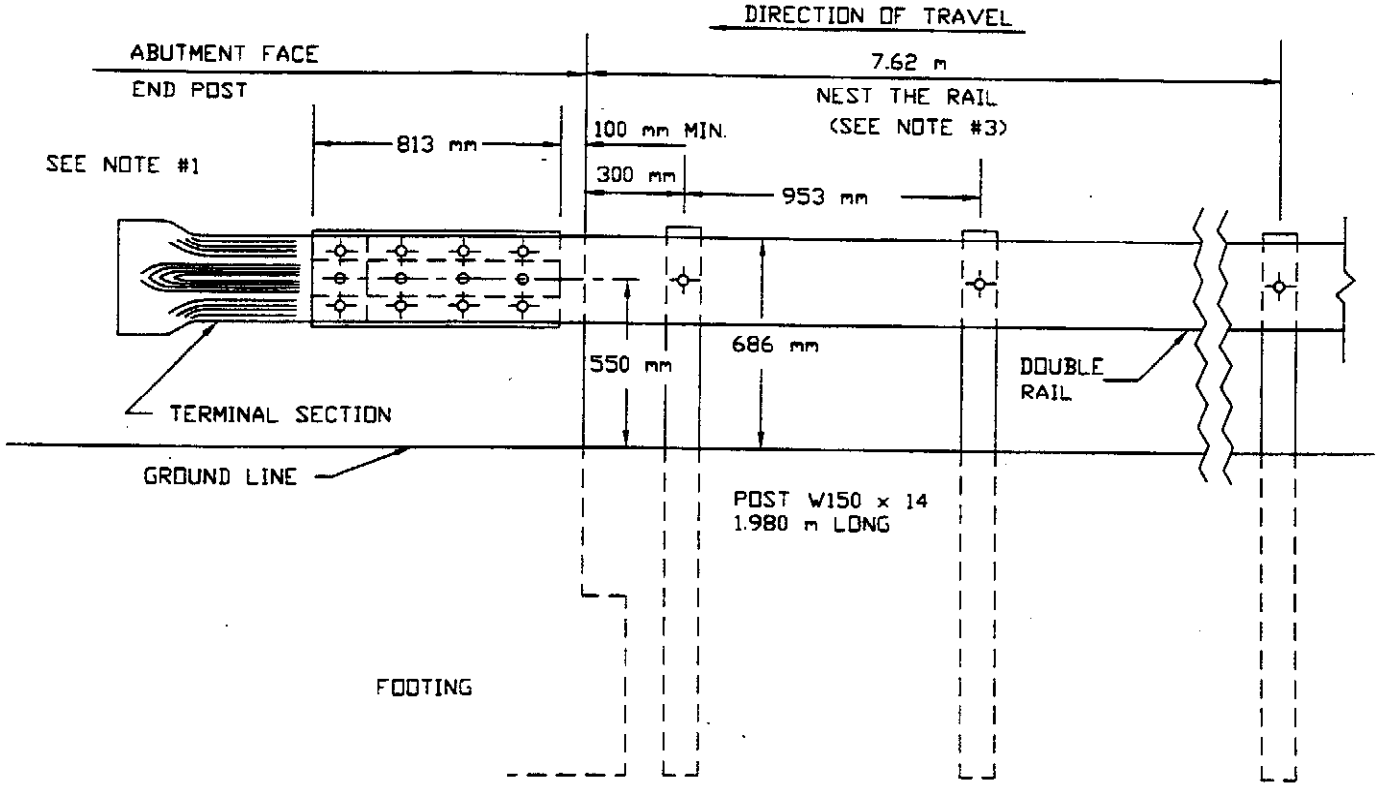
METHOD OF PLACING GUARD RAIL TERMINAL CONNECTORS ON EXIST. BRIDGE W-RAIL LEADING END AT ABUTMENTS & END POSTS

DATE OF ISSUE
9/22/95

DRAWING NUMBER
402.2.0



PLAN

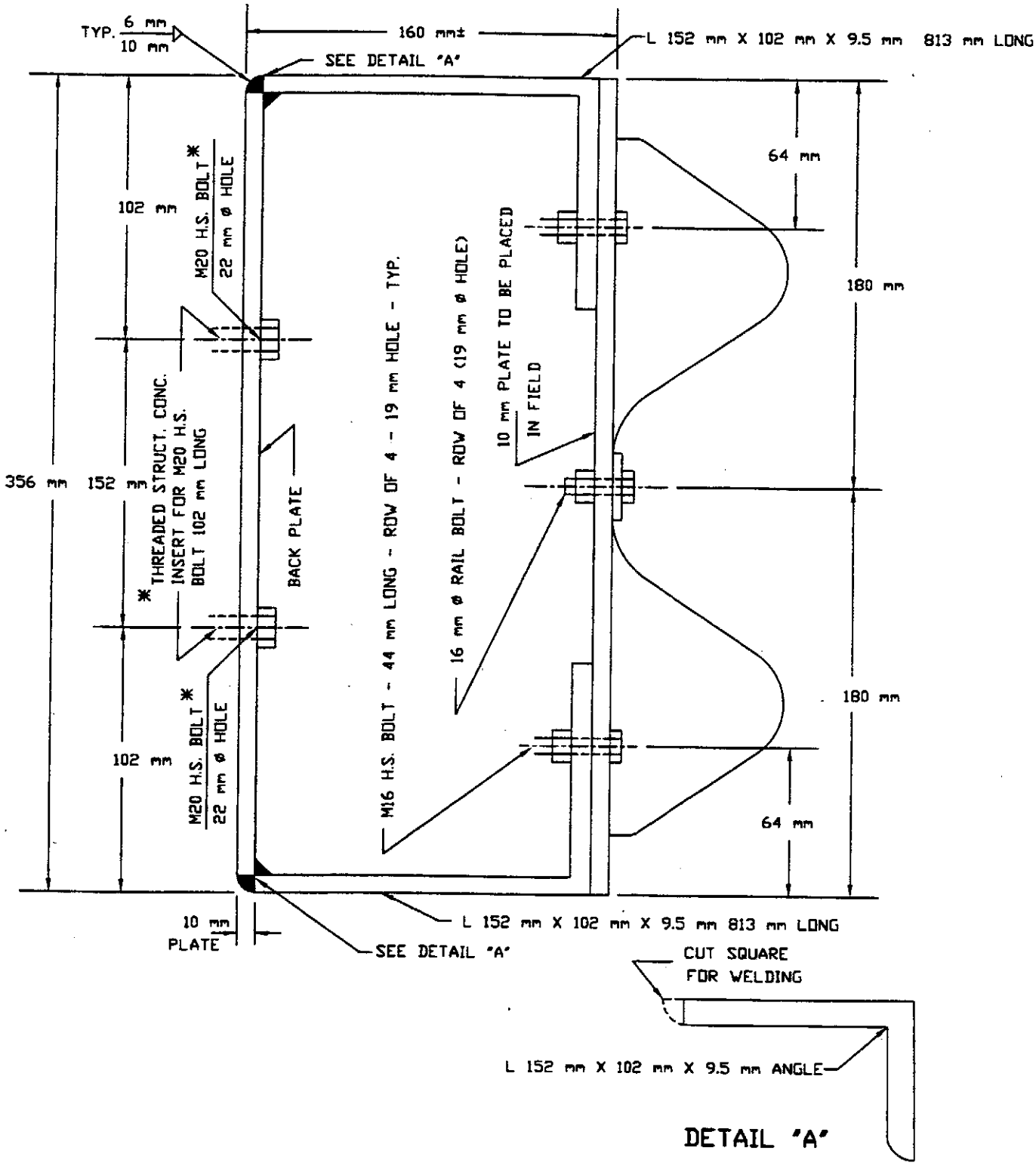


ELEVATION

NOTES:

1. FOR BRACKET DETAIL SEE DRAWINGS 402.4.0 AND 402.5.0
2. FOR NESTING DETAIL SEE DRAWING 402.2.0
3. BACK UP PLATE NOT REQUIRED WHERE RAILING IS NESTED, SEE SECTION B-B DRAWING 402.2.0

MASS HIGHWAY CONSTRUCTION STANDARDS	INSTALLATION OF STEEL BEAM GUARD RAIL (TRAILING END) AT EXISTING BRIDGE ABUTMENTS AND END POSTS (W-RAIL)	DATE OF ISSUE 9/22/95 DRAWING NUMBER **402.3.0**

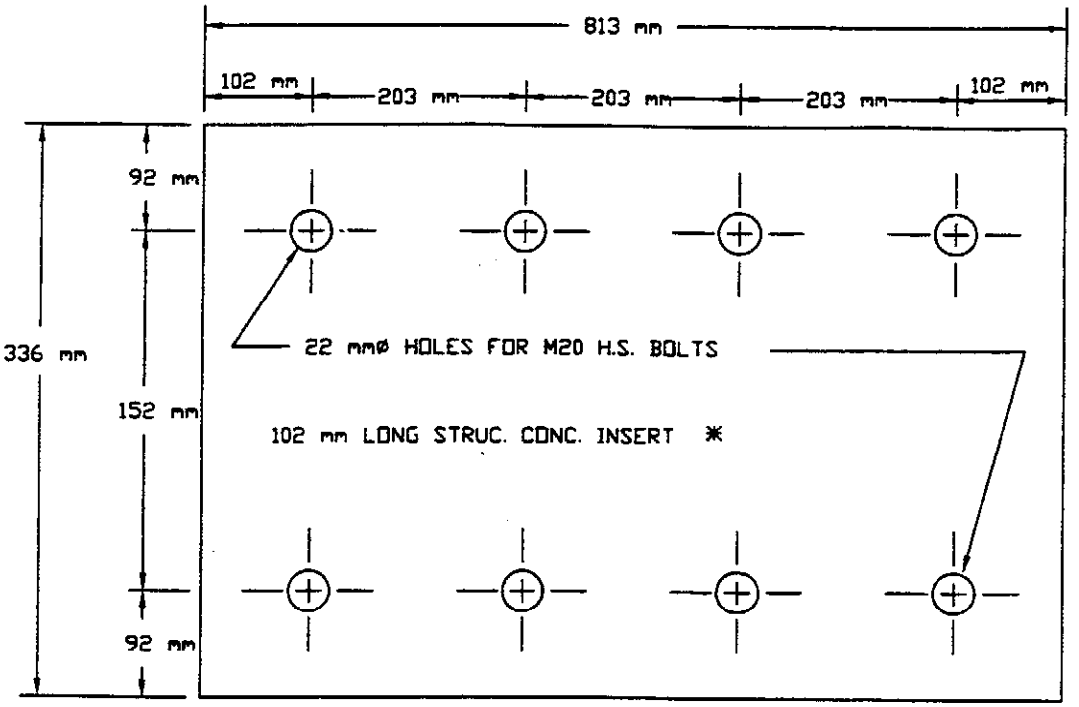


* IF BOLT IS THRU EXISTING HWY. GD. RECESS THAT IS FILLED WITH CONCRETE ADD THE DEPTH OF RECESS TO THE 102 mm LENGTH OF INSERT SIMILARLY TO M20 BOLT.

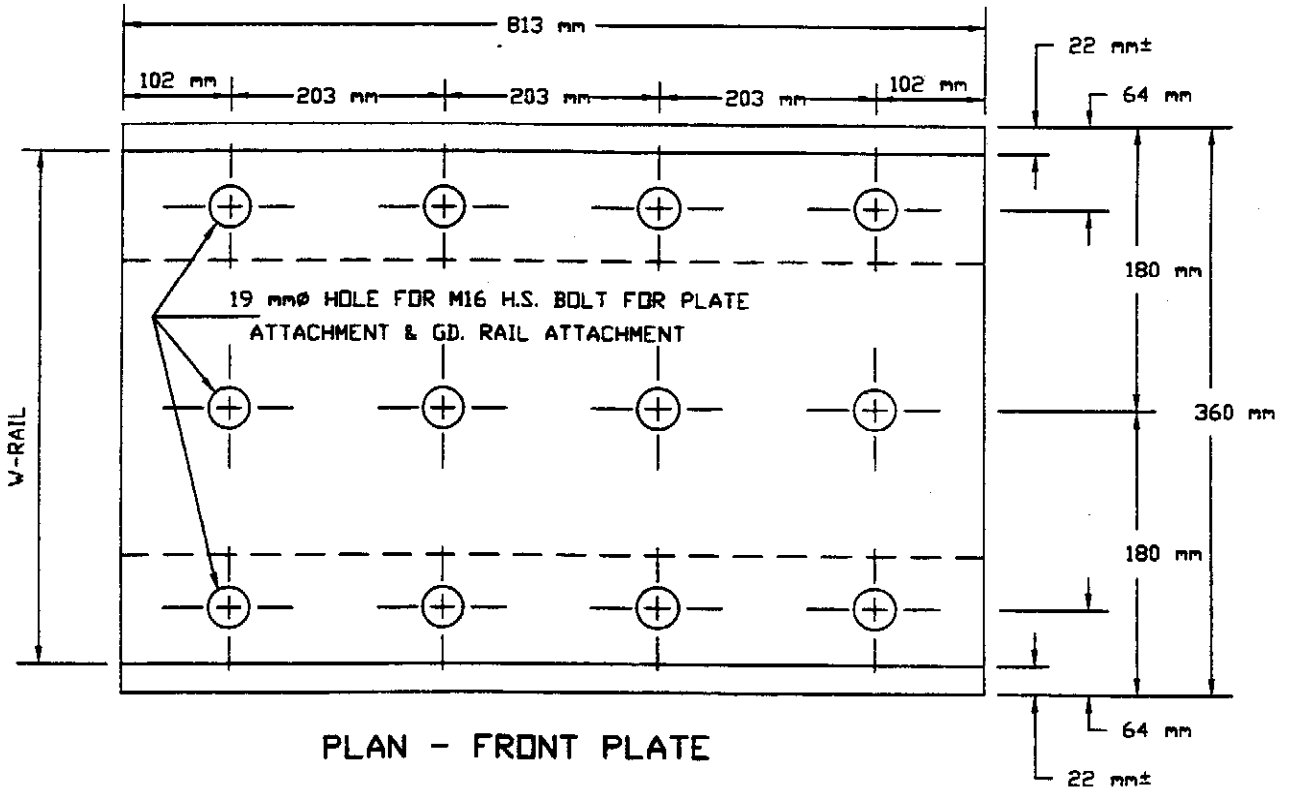
NOTES:

1. ALL EXISTING HWY. GD. RECESSES TO BE FILLED WITH EPOXY CONCRETE.
2. ALL WELDING IS TO BE DONE IN THE SHOP AND ALL WELD DIMENSIONS SHOWN ARE IN MILLIMETERS.

MASS HIGHWAY CONSTRUCTION STANDARDS	MASONRY BRACKET FOR HIGHWAY GUARD TYPE SS ON ABUTMENTS AND END POSTS (TRAILING END – W-RAIL)	DATE OF ISSUE 9/22/95
		DRAWING NUMBER 402.4.0



PLAN - BACK PLATE



PLAN - FRONT PLATE

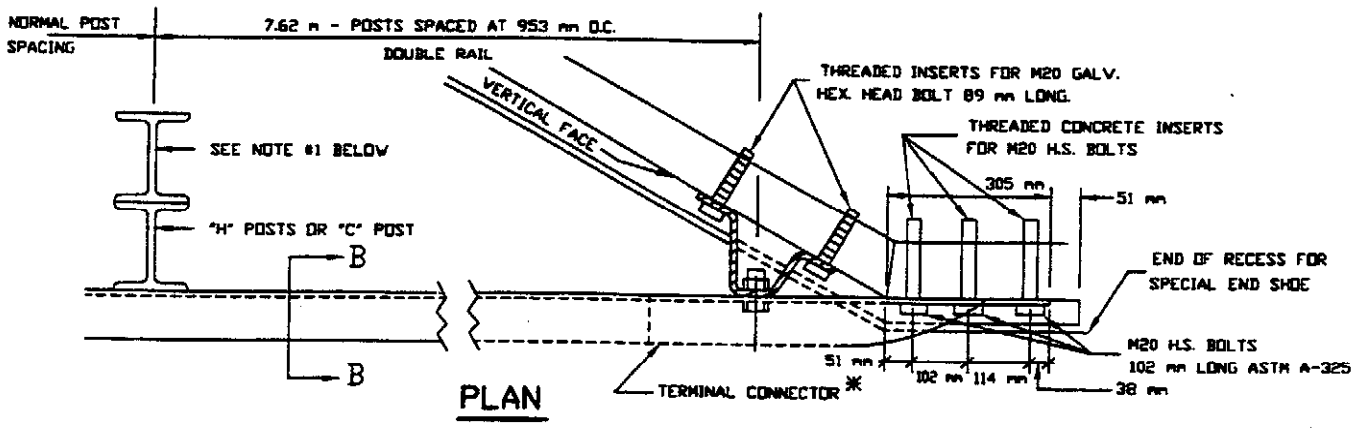
* IF BOLT IS THRU EXISTING HWY. GD. RECESS THAT IS FILLED WITH CONCRETE ADD THE DEPTH OF THE RECESS TO THE 102 mm LENGTH OF INSERT AND SIMILARLY TO M20 BOLT.

MASS HIGHWAY CONSTRUCTION STANDARDS

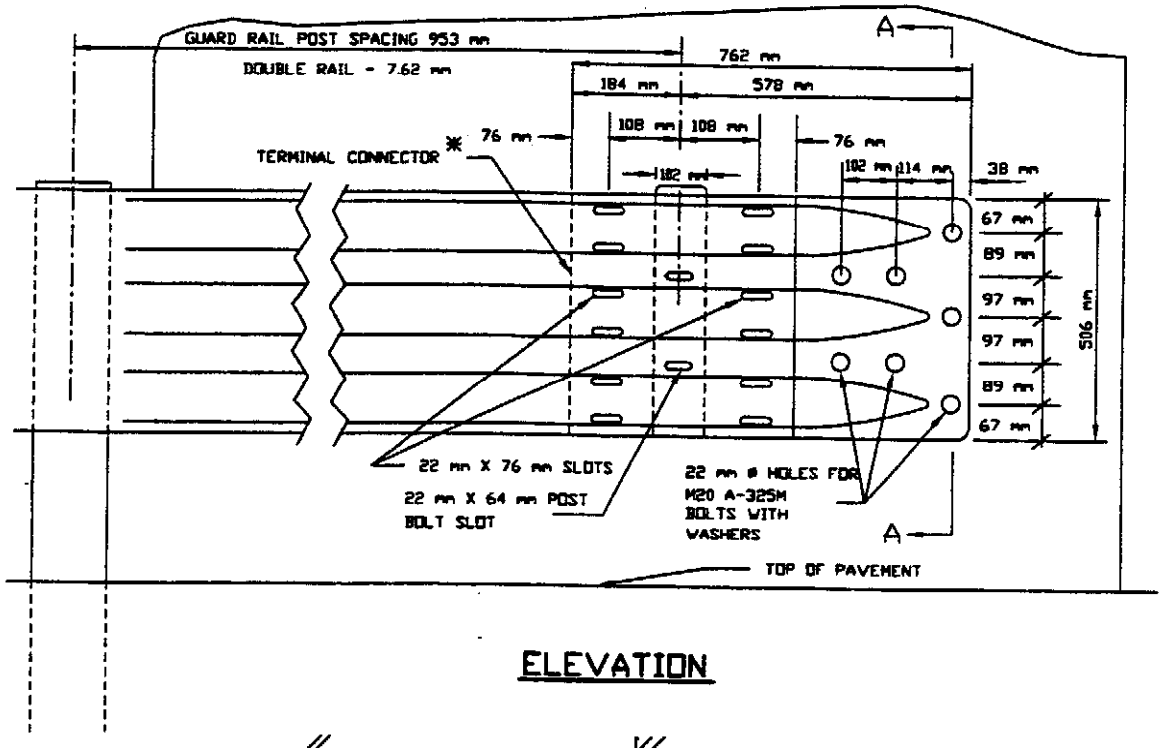
MASONRY BRACKET FOR HIGHWAY GUARD TYPE SS ON ABUTMENTS AND END POSTS (TRAILING END - W-RAIL)

DATE OF ISSUE 9/22/95

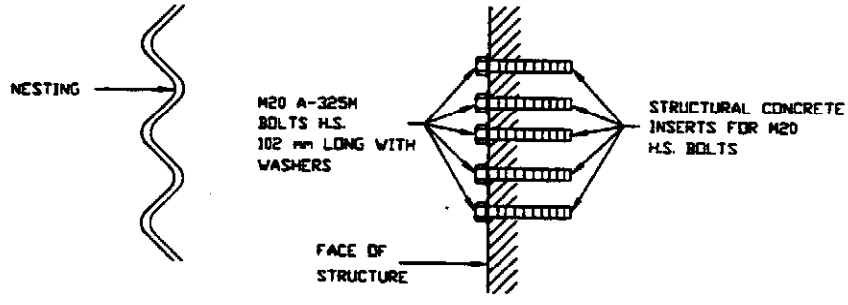
DRAWING NUMBER **402.5.0**



PLAN



ELEVATION



SECTION B-B
2 RAILS

SECTION A-A

* SEE BRIDGE STANDARDS FOR DETAILS; LAP IN DIRECTION OF TRAVEL.

NOTES:

1. CONSTRUCTION DETAILS SHOWN ALSO APPLY TO CHARLEY (C) POST INSTALLATIONS.
2. THE DOUBLE RAIL ELEMENT IS TO CONSIST OF NESTING TWO (2) 2.7 mm THK RAIL ELEMENTS FOR A DISTANCE OF 7.62 m, THE SHORT RAIL (7.62 m) IS TO BE NESTED BEHIND THE CONTINUOUS RAIL.
3. BACK UP PLATE NOT REQUIRED WHERE RAIL IS TO BE NESTED.
4. BRACKET WILL BE USED ON NEW STRUCTURES WITH FLARED END POST OTHERWISE THE STANDARD GUARD RAIL POST WILL BE USED.

MASS HIGHWAY CONSTRUCTION STANDARDS

METHOD OF PLACING THRIE BEAM GUARD RAIL TERMINAL CONNECTORS ON PROP. BRIDGE STRUCTURE (LEADING AND TRAILING ENDS)

DATE OF ISSUE 9/22/95

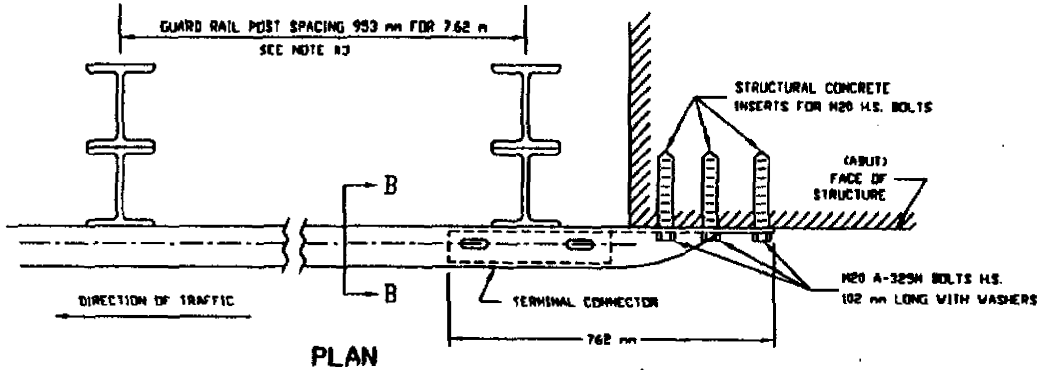
DRAWING NUMBER **402.6.0**

MASS HIGHWAY
CONSTRUCTION STANDARDS

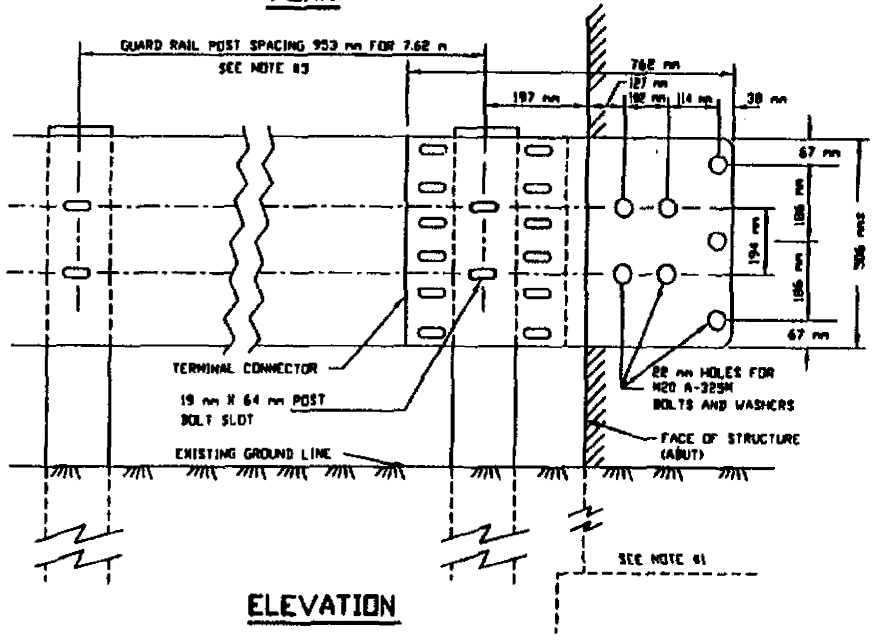
METHOD OF PLACING THRIE BEAM GUARD RAIL TERMINAL CONNECTORS ON AN EXIST. BRIDGE LEADING END AT ABUTMENT & END POST

DATE OF ISSUE 9/22/95

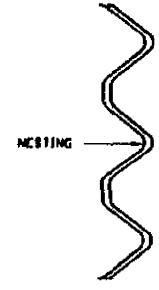
DRAWING NUMBER 402.7.0



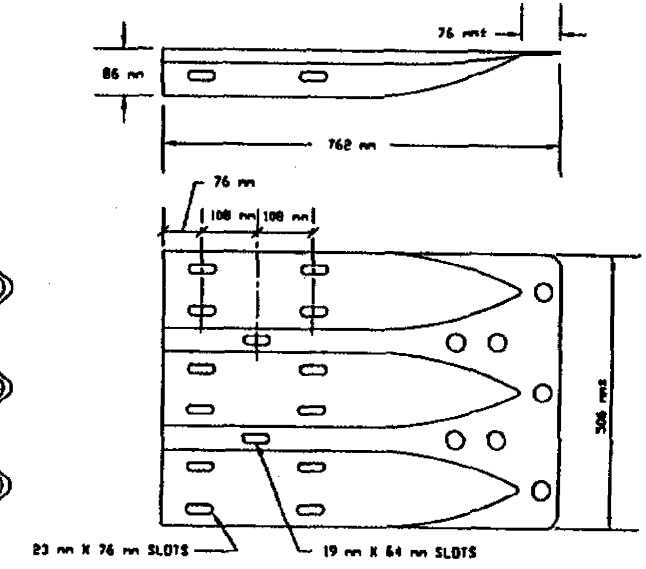
PLAN



ELEVATION



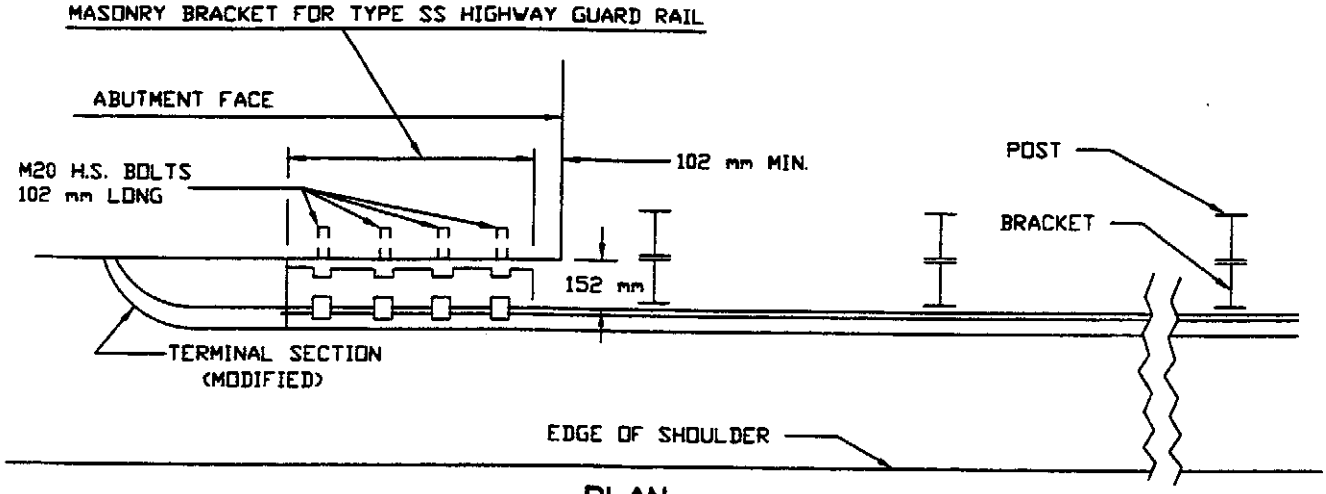
SECTION B-B
(2 RAILS)



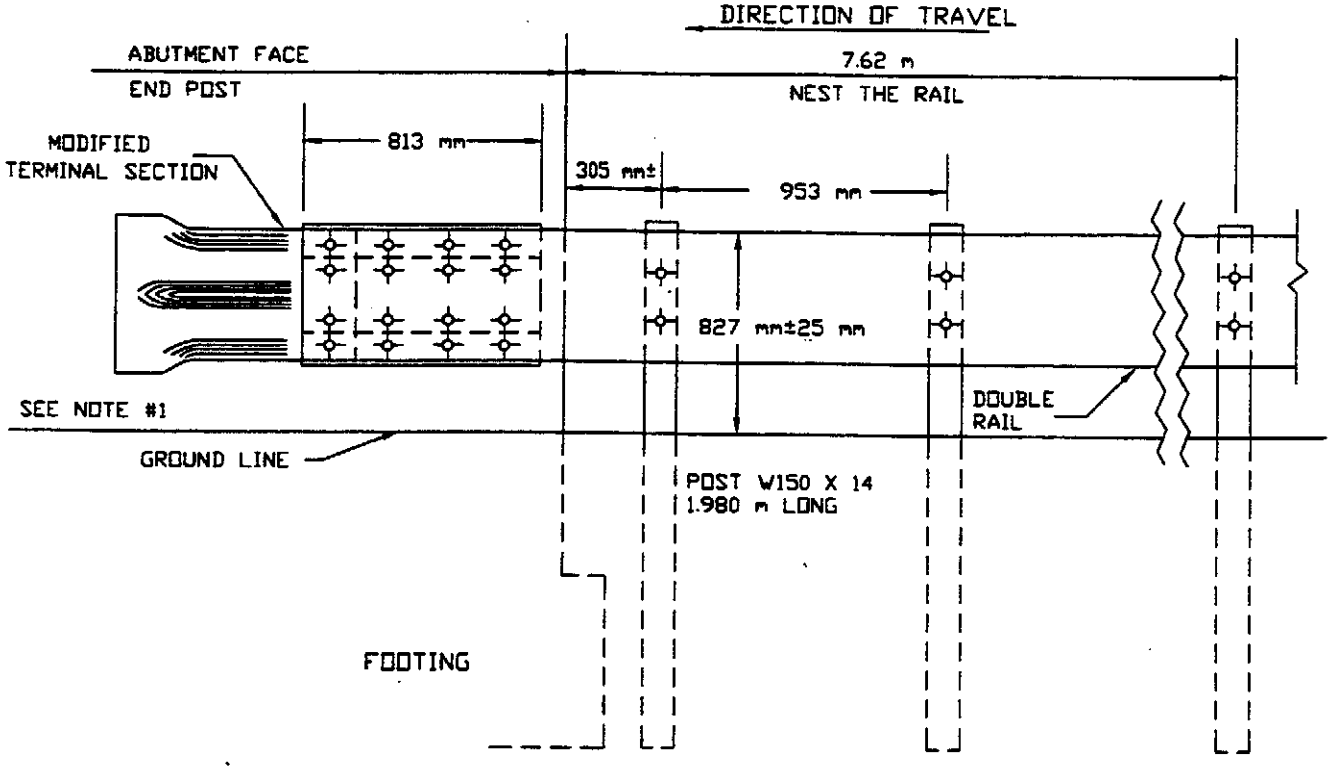
TERMINAL CONNECTOR

NOTES:

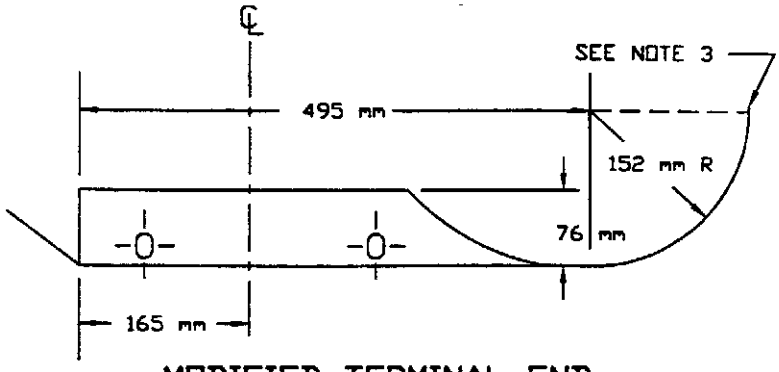
1. WHEN THE HIGHWAY GUARD POST FALLS ON THE FOOTING OF THE STRUCTURE AND THE DISTANCE FROM THE SURFACE TO THE TOP OF THE FOOTING IS LESS THAN 991 mm THE POST SHALL BE CUT AND SET ON THE FOOTING IN A CEMENT CONCRETE ENVELOPE AS SHOWN IN DETAIL "A" DRAWINGS 402.2.0 AND 401.12.0
2. CONSTRUCTION DETAILS SHOWN ALSO APPLY TO WOOD AND CHARLEY (C) POST INSTALLATIONS.
3. THE DOUBLE RAIL ELEMENT IS TO CONSIST OF NESTING TWO (2) 2.7 mm THK RAIL ELEMENTS FOR A DISTANCE OF 7.62 m, THE SHORT RAIL (7.62 m) IS TO BE NESTED BEHIND THE CONTINUOUS RAIL, SEE SECTION B-B.
4. BACK UP PLATE NOT REQUIRED WHERE RAIL IS TO BE NESTED.



PLAN



ELEVATION



MODIFIED TERMINAL END

NOTES:

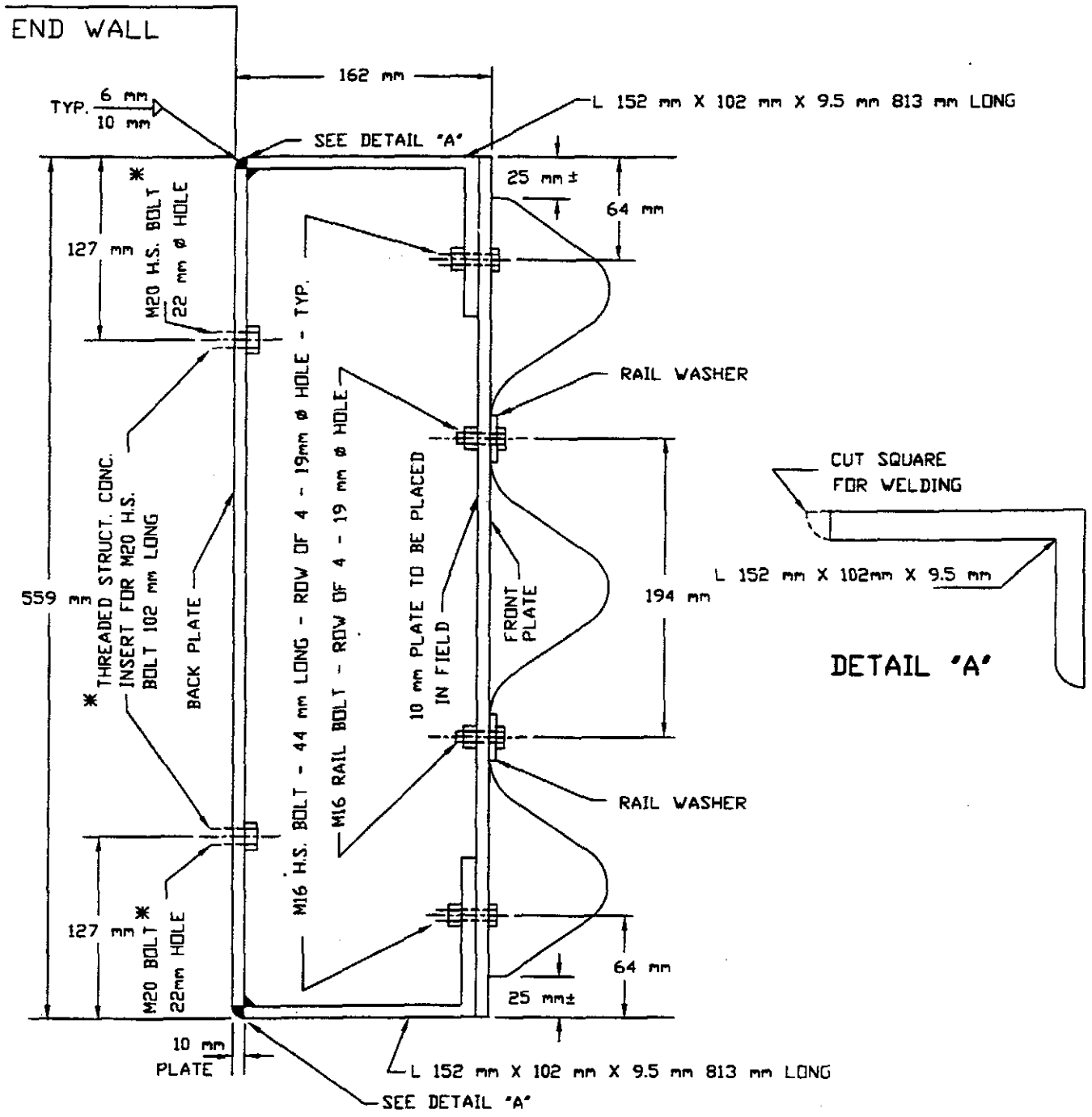
1. FOR BRACKET DETAIL SEE DRAWINGS 402.9.0 AND 402.10.0
2. FOR NESTING SEE DRAWING 402.7.0
3. STANDARD TERMINAL END MAY BE CUT AND FINISHED IN ACCORDANCE WITH STANDARD SPECIFICATIONS.
4. BACKUP PLATE NOT REQUIRED WHEN RAILING IS NESTED.
5. GUARD RAIL POST SPACING 953 mm FOR 7.62 m.

MASS HIGHWAY
CONSTRUCTION STANDARDS

INSTALLATION OF STEEL THRIE BEAM GUARD RAIL (TRAILING END) AT EXISTING BRIDGE ABUTMENTS AND END POSTS

DATE OF ISSUE
9/22/95

DRAWING NUMBER
402.8.0



* IF BOLT IS THRU EXISTING HWY. GD. RECESS THAT IS FILLED WITH CONCRETE ADD THE DEPTH OF RECESS TO THE 102 mm LENGTH OF INSERT SIMILARLY TO M20 BOLT.

NOTES:

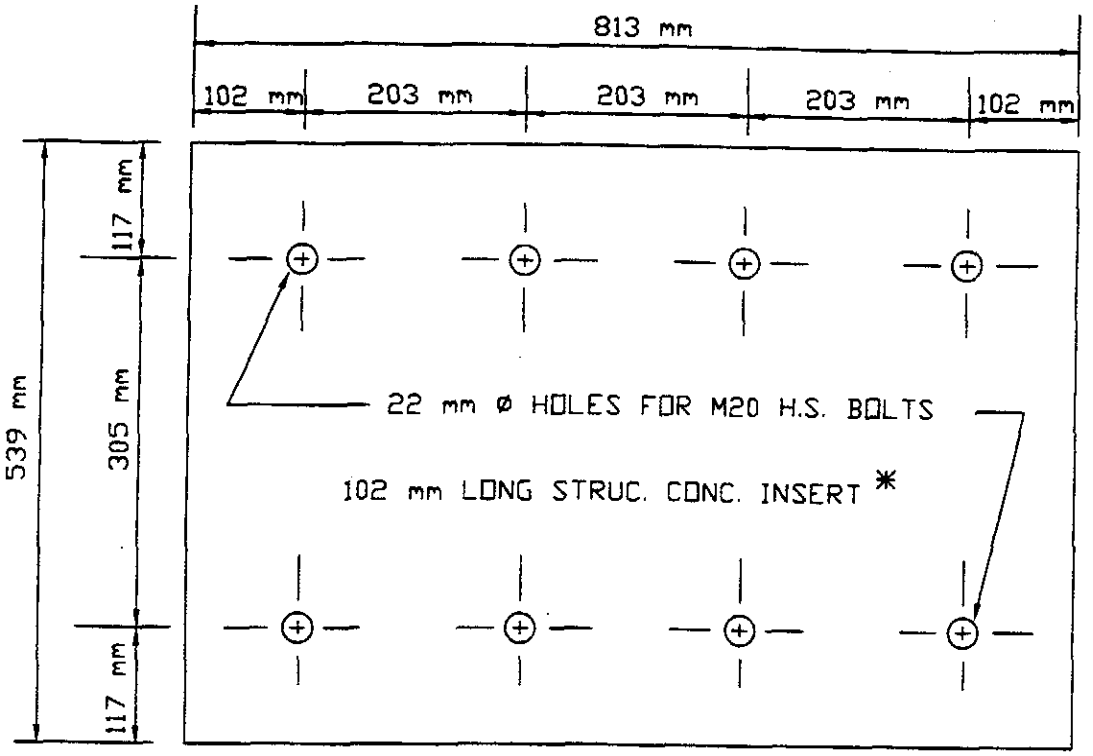
1. ALL EXISTING HWY. GD. RECESSES TO BE FILLED WITH EPOXY CONCRETE
2. ALL WELDING IS TO BE DONE IN THE SHOP AND ALL WELD DIMENSIONS SHOWN ARE IN MILLIMETERS.

MASS HIGHWAY CONSTRUCTION STANDARDS

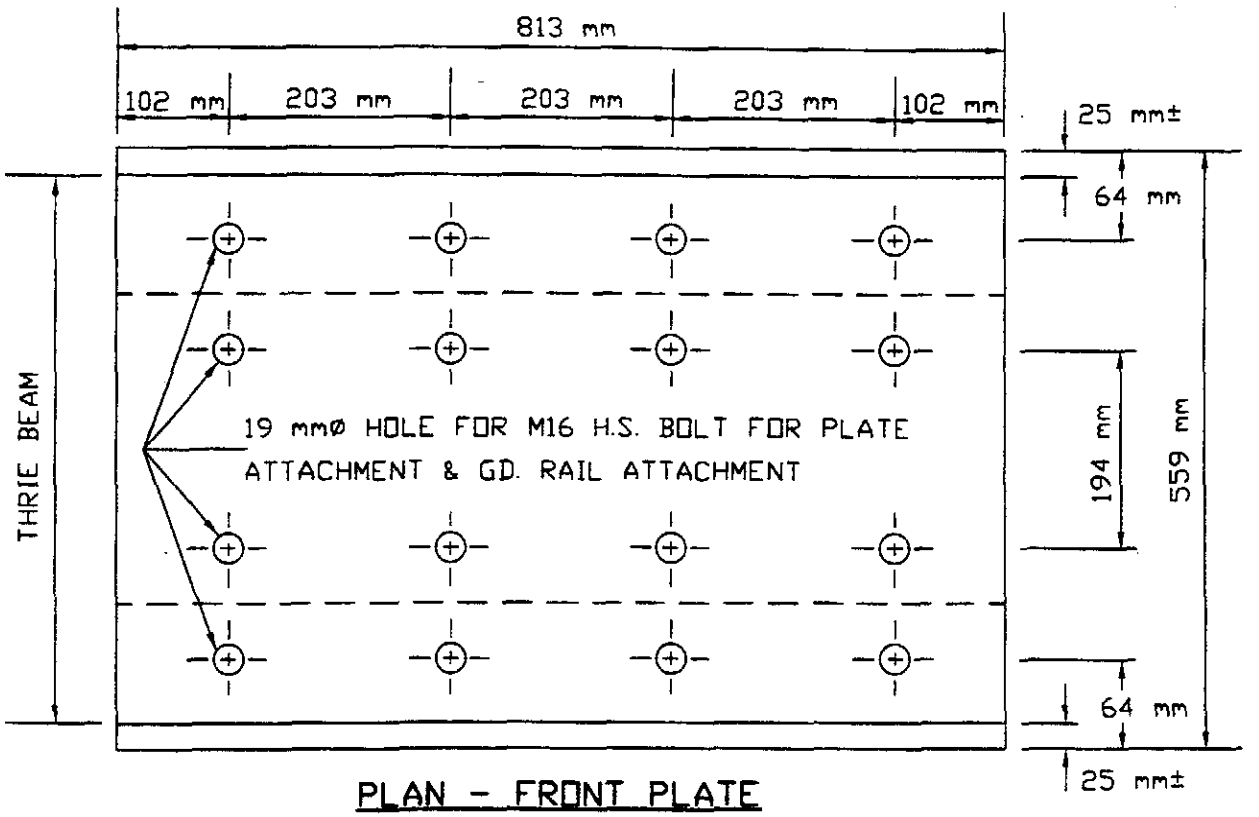
MASONRY BRACKET FOR THRIE BEAM HIGHWAY GUARD ON ABUTMENTS AND END POSTS (TRAILING END)

DATE OF ISSUE 9/22/95

DRAWING NUMBER **402.9.0**



PLAN - BACK PLATE



PLAN - FRONT PLATE

* IF BOLT IS THRU EXISTING HWY. GD. RECESS THAT IS FILLED WITH CONCRETE ADD THE DEPTH OF THE RECESS TO THE 102 mm LENGTH OF INSERT AND SIMILARLY TO M20 BOLT.

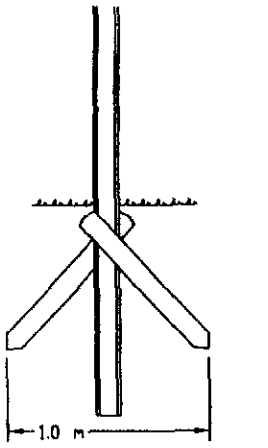
MASS HIGHWAY CONSTRUCTION STANDARDS	MASONRY BRACKET FOR THRIE BEAM HIGHWAY GUARD ON ABUTMENTS AND END POSTS (TRAILING END)	DATE OF ISSUE 9/22/95 DRAWING NUMBER 402.10.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

DETAILS FOR CHAIN LINK FENCE WITH SPRING TENSION WIRE

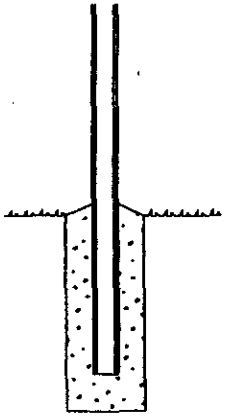
DATE OF ISSUE 9/22/95

DRAWING NUMBER 404.1.0

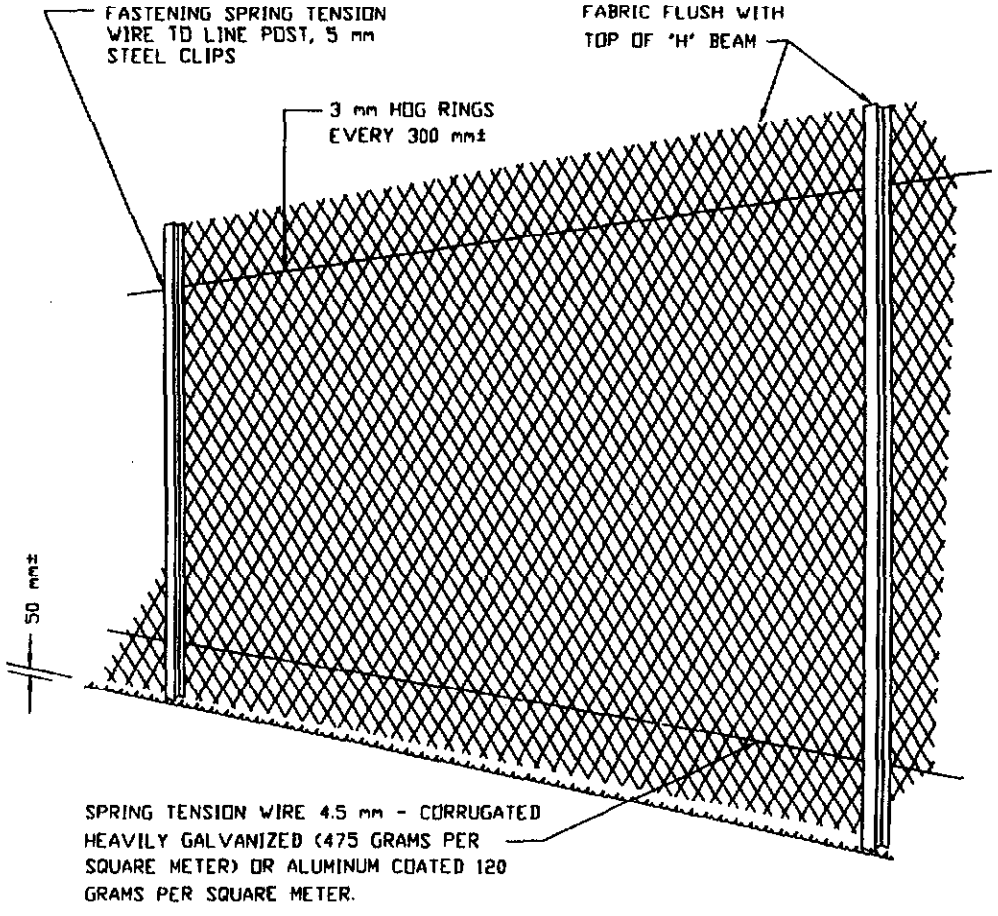


FABRIC PLACED PERPENDICULAR TO THE ANCHOR

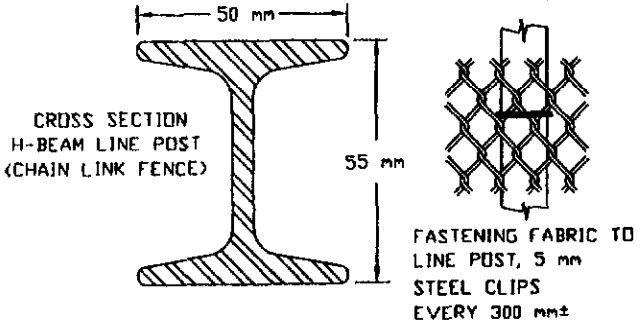
DETAIL SHOWING LINE POST SET WITH DRIVE ANCHORS



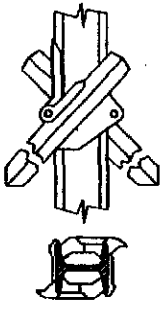
DETAIL SHOWING LINE POST SET IN CONCRETE FOOTING



CHAIN LINK FENCE WITH SPRING TENSION WIRE
(ALUMINUM COATED FENCE)



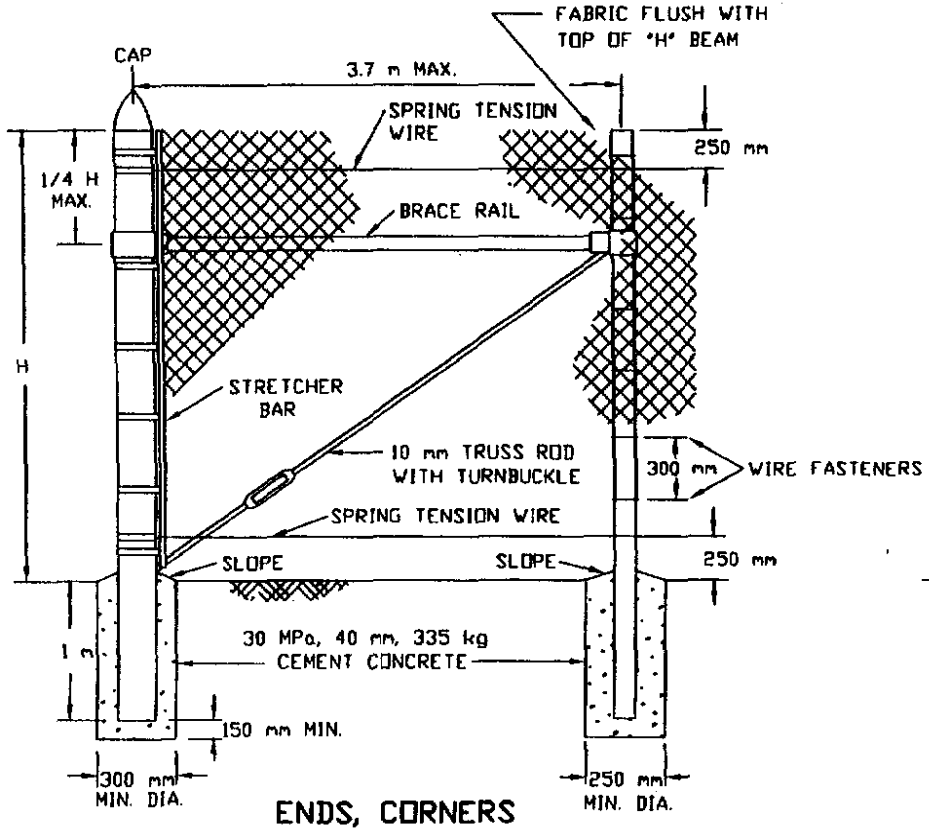
STEEL OR ALUMINUM 'H' BEAM LINE POST



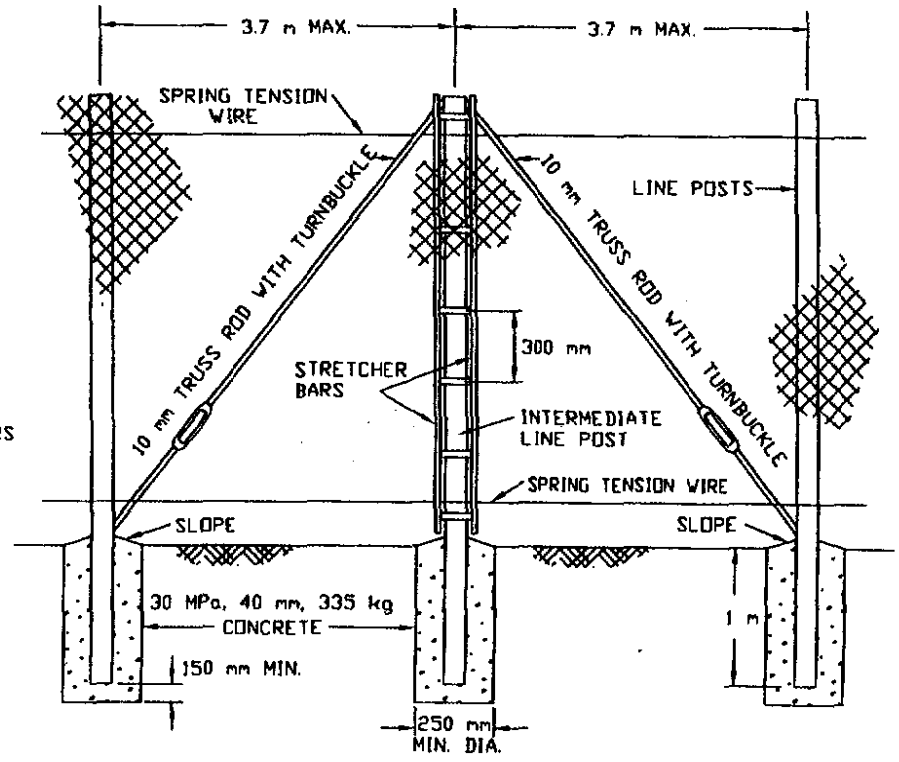
DETAIL OF AN ANCHOR CLAMP SHOWING POSITION OF THE ANCHOR

MASS HIGHWAY
CONSTRUCTION STANDARDS

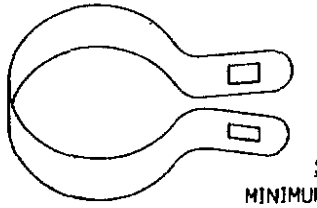
CHAIN LINK FENCE WITH SPRING TENSION WIRE



ENDS, CORNERS



INTERMEDIATE POST



END BAND

SPRING TENSION WIRE

MINIMUM OF (5) TURNS AROUND THE SPRING TENSION WIRE TO END INSTALLATION. ALL BANDS SHALL BE SQUARE ON 'H' POSTS AND ROUND ON ROUND POSTS.

NOTES:

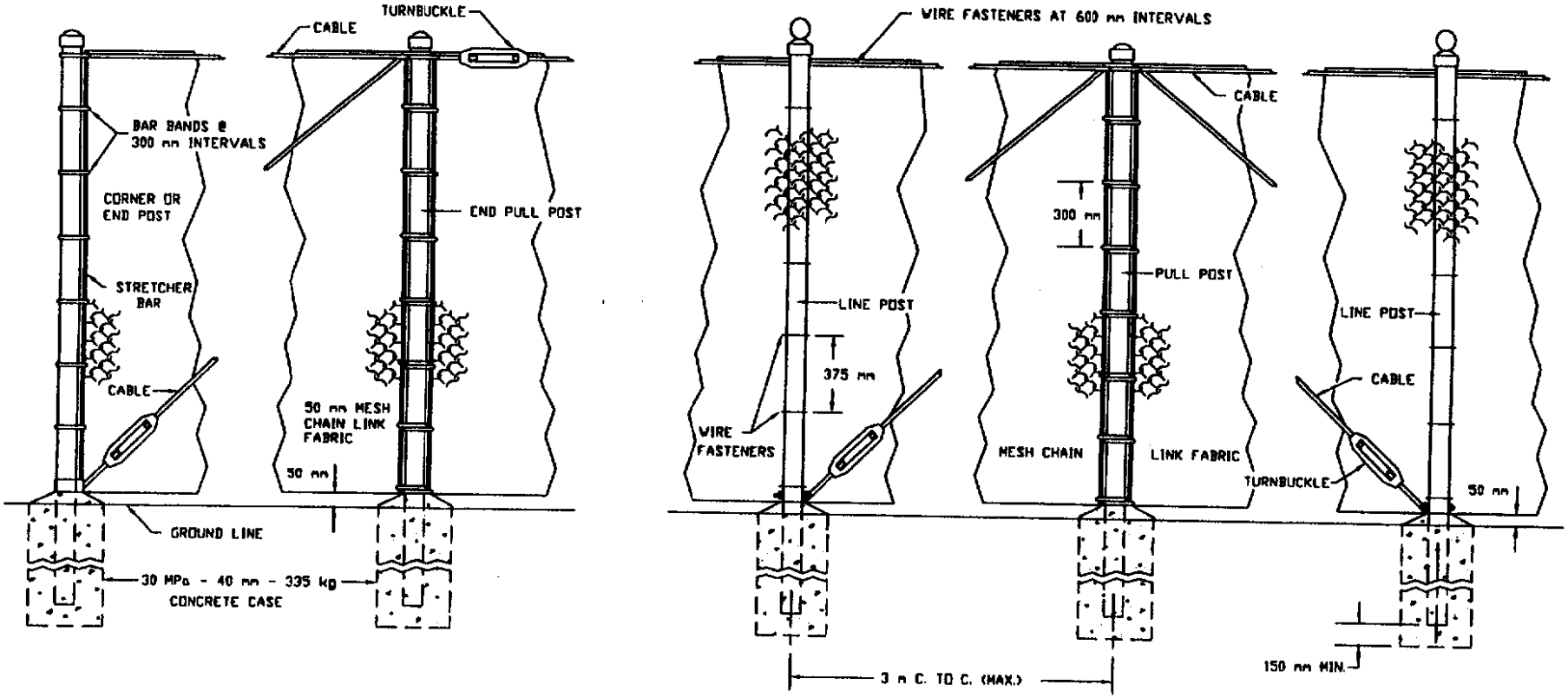
1. FABRIC FOR FENCES 1.2 m OR LESS IN HEIGHT; TOP SELVAGE TO HAVE KNUCKLED FINISH. BOTTOM SELVAGE TO HAVE TWISTED AND BARBED FINISH UNLESS OTHERWISE NOTED. FABRIC FOR FENCES 1.5 m OR OVER IN HEIGHT; BOTH TOP AND BOTTOM SELVAGE TO HAVE TWISTED AND BARBED FINISH UNLESS OTHERWISE NOTED.
2. GRADE OF FENCE TO BE PARALLEL WITH THE GRADE OF SIDEWALKS, CURBING, GROUND OR TOP OF WALL.
3. INTERMEDIATE POST INTERVALS NOT TO EXCEED 150 m.
4. SPACING OF LINE POST ON CURVES, SEE DRAWING 404.4.0
5. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.
6. SPRING TENSION WIRE TO BE FASTENED TO FABRIC WITH 3 mm HOG RINGS AT 300 mm INTERVALS.
7. SPRING TENSION WIRE TO BE FASTENED TO LINE POSTS WITH 5 mm STEEL CLIPS.
8. LINE POSTS TO BE DRIVEN EXCEPT WHERE NOTED ABOVE.

DATE OF ISSUE 9/22/95

DRAWING NUMBER 404.2.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

CHAIN LINK FENCE WITH TOP TENSION CABLE



NOTES:

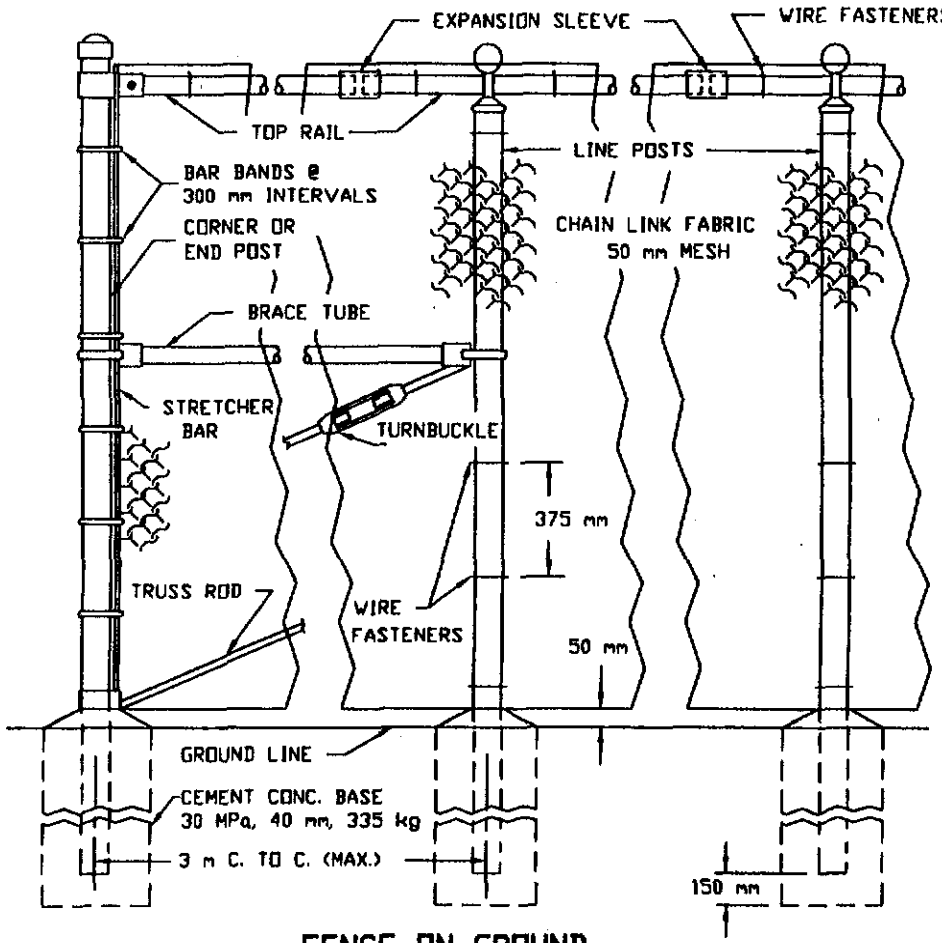
1. FABRIC FOR FENCES 1.2 m OR LESS IN HEIGHT. TOP SELVAGE TO HAVE KNUCKLED FINISH. BOTTOM SELVAGE TO HAVE TWISTED AND BARBED FINISH UNLESS OTHERWISE NOTED. FABRIC FOR FENCES 1.5 m OR OVER IN HEIGHT. BOTH TOP AND BOTTOM SELVAGE TO HAVE TWISTED AND BARBED FINISH UNLESS OTHERWISE NOTED.
2. THE HEIGHT OF FENCE TO BE AS SPECIFIED.
3. GRADE OF FENCE TO BE PARALLEL WITH THE GRADE OF SIDEWALKS, CURBING, GROUND OR TOP OF WALL.
4. FOR POST BASES AND CABLE ATTACHMENTS SEE DRAWING 404.5.0
5. PULL POST INTERVALS NOT TO EXCEED 150 m.
6. SPACING OF LINE POSTS ON CURVES, SEE DRAWING 404.4.0
7. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

DATE OF ISSUE 9/22/95

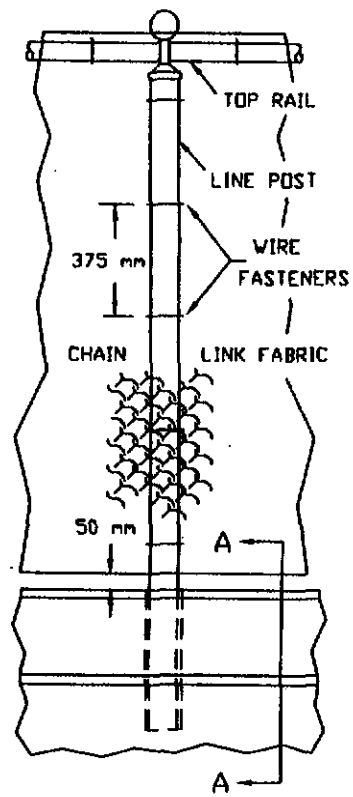
DRAWING NUMBER 404.3.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

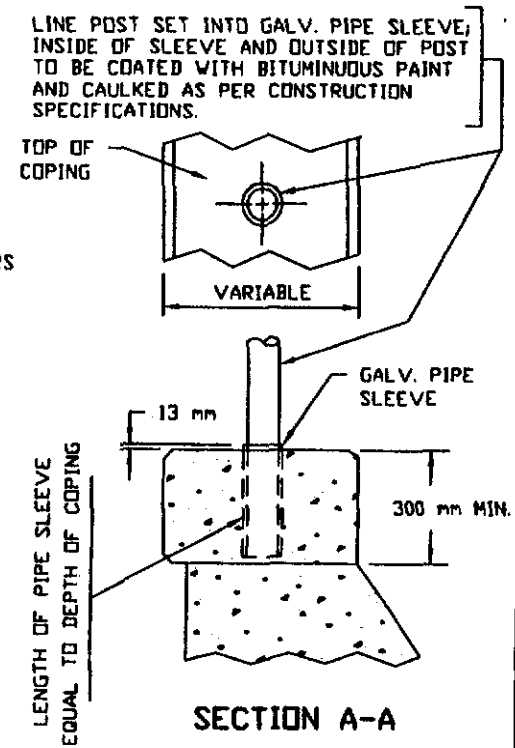
CHAIN LINK FENCE WITH TOP RAIL



FENCE ON GROUND



FENCE ON CONCRETE WALL



SECTION A-A

NOTES:

1. FABRIC FOR FENCES 1.2 m OR LESS IN HEIGHT.
   TOP SELVAGE TO HAVE KNUCKLED FINISH. BOTTOM SELVAGE TO HAVE TWISTED AND BARBED FINISH UNLESS OTHERWISE NOTED.
   FABRIC FOR FENCES 1.5 m OR OVER IN HEIGHT.
   BOTH TOP AND BOTTOM SELVAGE TO HAVE TWISTED AND BARBED FINISH UNLESS OTHERWISE NOTED.
2. THE HEIGHT OF FENCE TO BE AS SPECIFIED.
3. GRADE OF FENCE TO BE PARALLEL WITH THE GRADE OF SIDEWALKS, CURBING, GROUND OR TOP OF WALL.
4. LINE POSTS TO BE SPACED 3 m C. TO C. MAXIMUM EXCEPT ON CURVES WHERE THEY SHALL BE SPACED AS FOLLOWS:

CURVES 60 m TO 150 m RADIUS	2.5 m C. TO C. MAXIMUM
CURVES 30 m TO 60 m RADIUS	2.0 m C. TO C. MAXIMUM
CURVES LESS THAN 30 m RADIUS	1.5 m C. TO C. MAXIMUM

5. FOR POST BASES AND CABLE ATTACHMENTS, SEE DRAWING 404.5.0
6. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

DATE OF ISSUE 9/22/95

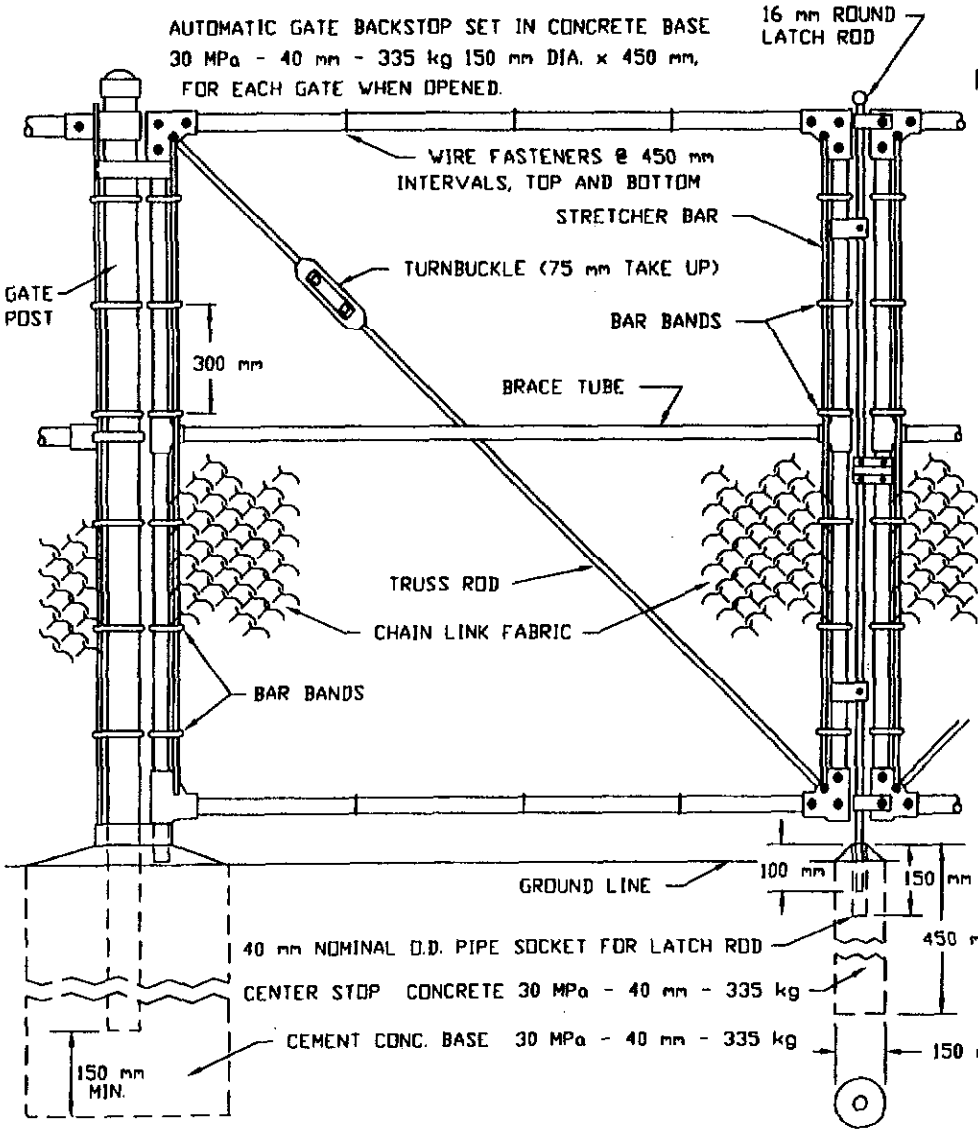
DRAWING NUMBER 404.4.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

CHAIN LINK FENCE – GATE

DRAWING NUMBER 404.6.0

DATE OF ISSUE 9/22/95



DOUBLE GATES

* END POSTS TO BE USED ON LATCH SIDE OF SINGLE GATE OPENINGS.

NOTES:

1. TUBULAR GATE POSTS

		STEEL	ALUMINUM
*	SINGLE GATE OPENING UP TO 1.85 m	100 mm NOM. O.D.	75 mm NOM. O.D.
	DOUBLE GATE OPENING UP TO 3.70 m	100 mm NOM. O.D.	75 mm NOM. O.D.
*	SINGLE GATE OPENING 2.10 - 3.95 m	100 mm NOM. O.D.	100 mm NOM. O.D.
	DOUBLE GATE OPENING 3.95 m - 8.00 m	100 mm NOM. O.D.	100 mm NOM. O.D.
*	SINGLE GATE OPENING 4.25 m - 5.50 m	100 mm NOM. O.D.	170 mm NOM. O.D.
	DOUBLE GATE OPENING 8.20 m - 11.00 m	100 mm NOM. O.D.	170 mm NOM. O.D.

THE ABOVE LIMITS OF THE OPENINGS ARE INCLUSIVE

2. GATE FRAMES & BRACES

	STEEL	ALUMINUM
SINGLE GATE FRAME UP TO 1.83 m	40 mm N.O.D.	50 mm N.O.D.
SINGLE GATE FRAME OVER 1.83 m	50 mm N.O.D.	50 mm N.O.D.

3. TRUSS RODS	STEEL	ALUMINUM
DIAMETER	10 mm	10 mm

4. CHAIN LINK FABRIC FOR GATES TO BE THE SAME AS REQUIRED FOR FENCE.

5. FOR GATE POST BASE, SEE DRAWING 404.5.0

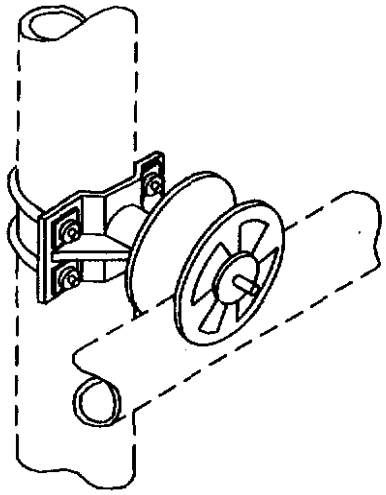
6. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

MASS HIGHWAY
CONSTRUCTION STANDARDS

CANTILEVER FITTINGS FOR TRUSS TYPE CONSTRUCTION GATES

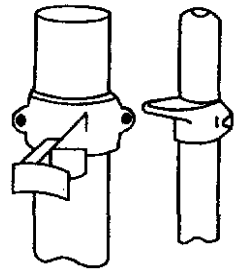
DATE OF ISSUE 9/22/95

DRAWING NUMBER 404.7.0

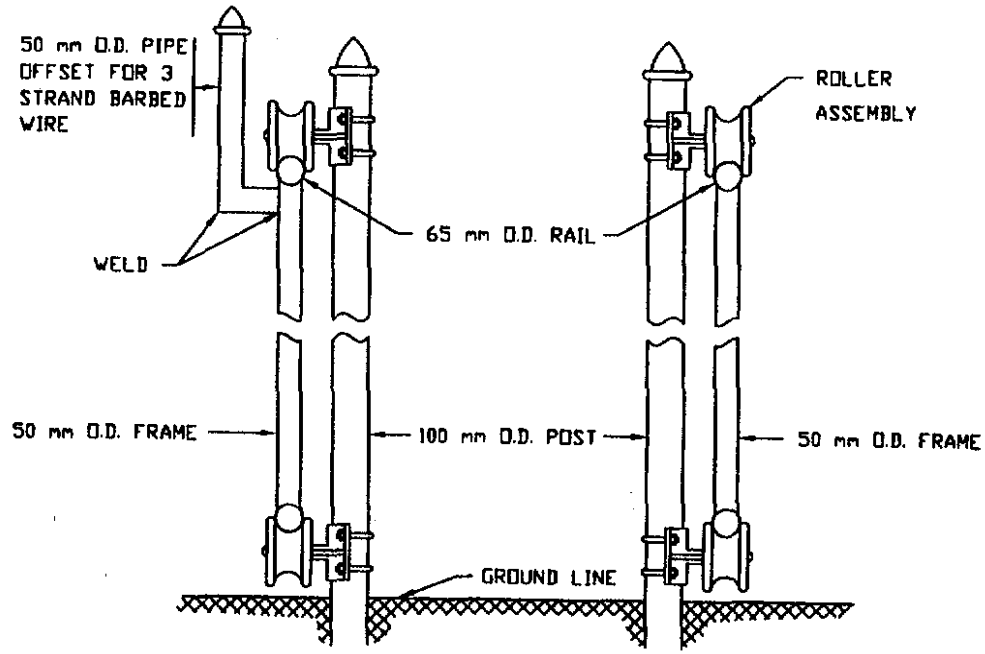


WHEEL EQUIPPED WITH ROLLER BEARINGS
AND LUBRICATION FITTING.
MASSIVE MALLEABLE CONSTRUCTION.
4 ASSEMBLIES NEEDED PER SECTION.

ROLLER ASSEMBLY



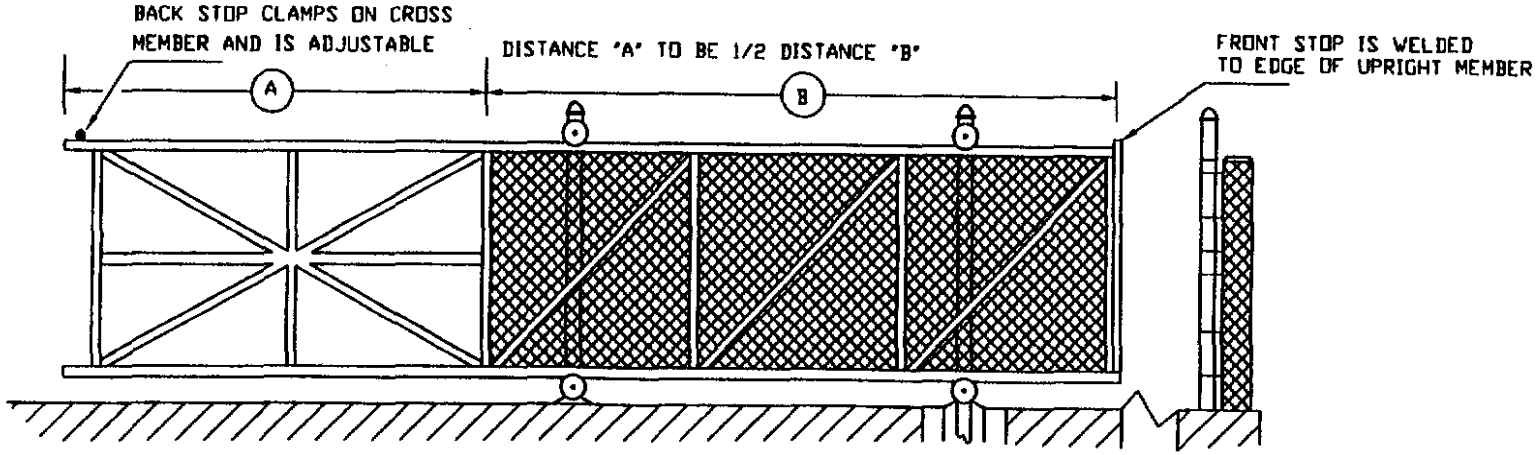
LATCH AND LOCKING ASSEMBLY



SPECIFICATIONS OF GATE FRAME

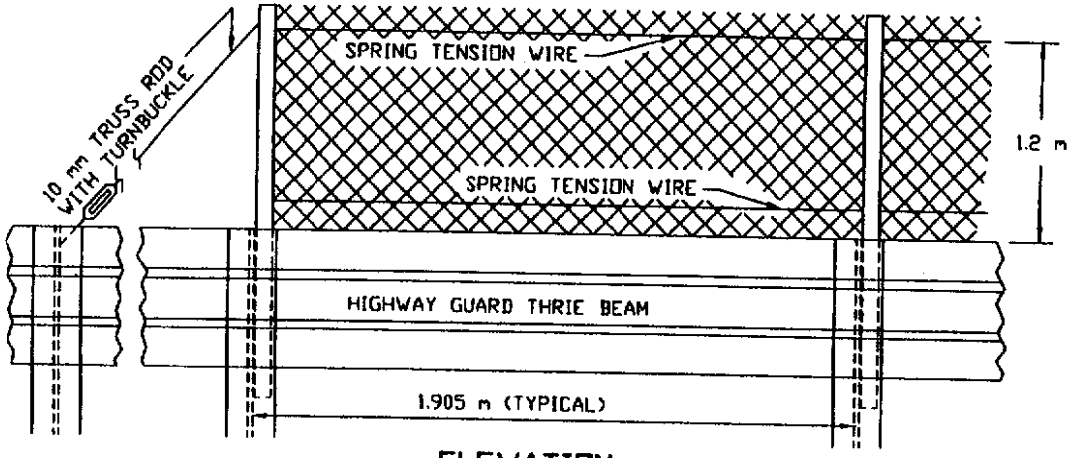
TOP AND BOTTOM MEMBER---------- 65 mm O.D. PIPE
UPRIGHT MEMBERS---------- 50 mm O.D. PIPE
HORIZONTAL AND DIAGONAL BRACES----- 40 mm O.D. PIPE

SIDE VIEW SHOWING TRUSS TYPE CONSTRUCTION

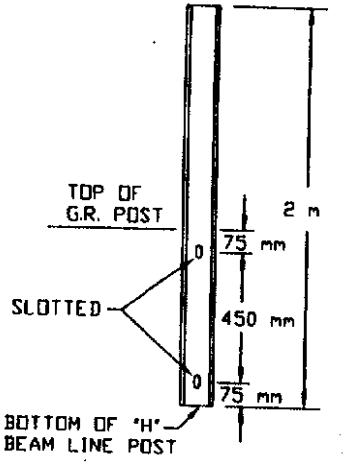


MASS HIGHWAY
CONSTRUCTION STANDARDS

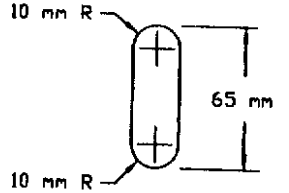
CHAIN LINK FENCE MOUNTED ON GUARD RAIL



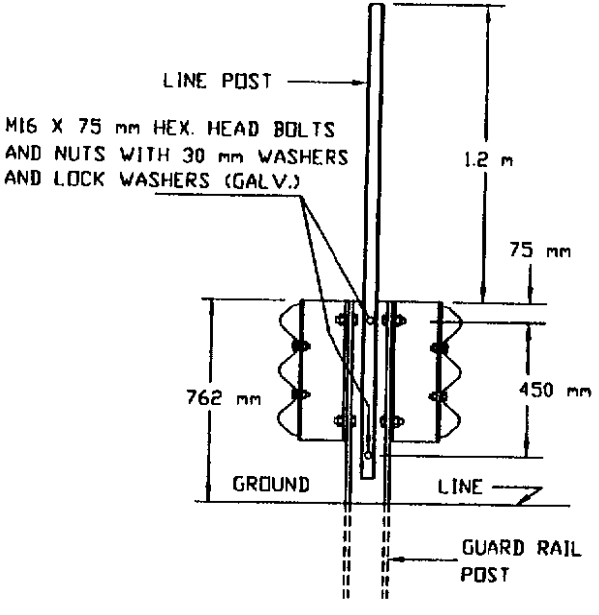
ELEVATION



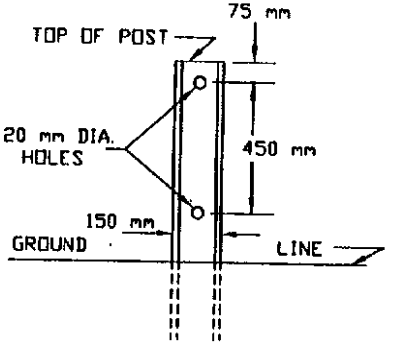
"H" POST (FENCE)



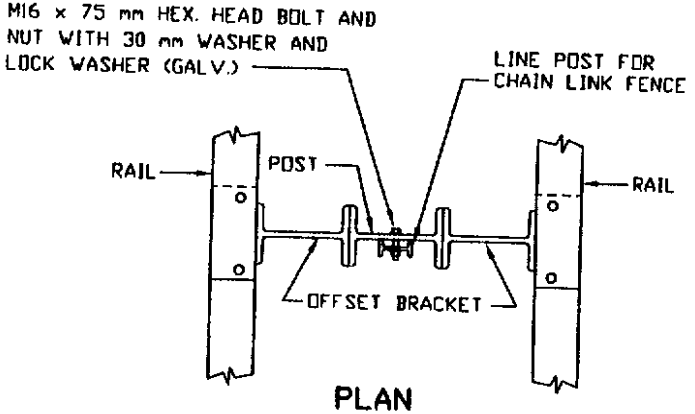
SLOT DETAIL



ELEVATION



G.R. POST



PLAN

NOTES:

1. ALL POSTS (LINE, END, AND INTERMEDIATE) SHALL CONFORM TO DETAILS SHOWN ON DRAWING 404.1.0
2. END BRACING TO CONFORM TO DETAIL SHOWN ABOVE. INTERMEDIATE BRACING SHALL BE IN CONFORMANCE TO DETAILS SHOWN ON DRAWING 404.2.0
3. FOR DESCRIPTION, MATERIALS AND METHODS, SEE STANDARD SPECIFICATIONS.

DATE OF ISSUE 9/22/95

DRAWING NUMBER **404.8.0**

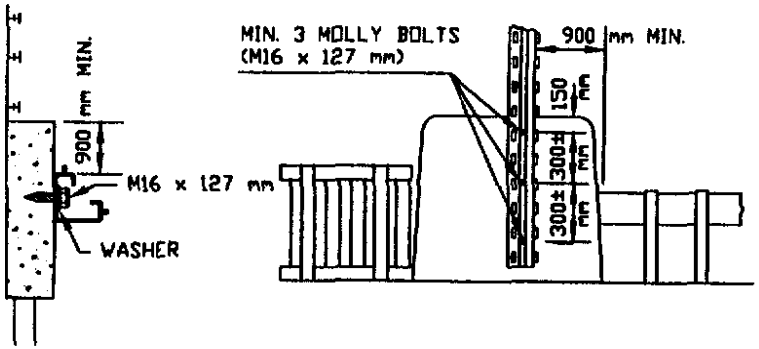
MASS HIGHWAY
CONSTRUCTION STANDARDS

CHAIN LINK FENCE POST DETAILS

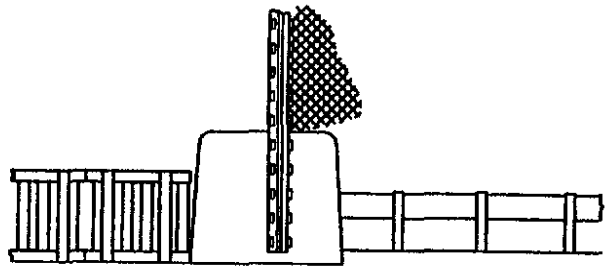
(C-POST)

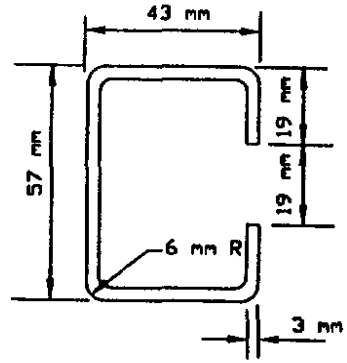
DATE OF ISSUE 9/22/95

DRAWING NUMBER 404.9.0

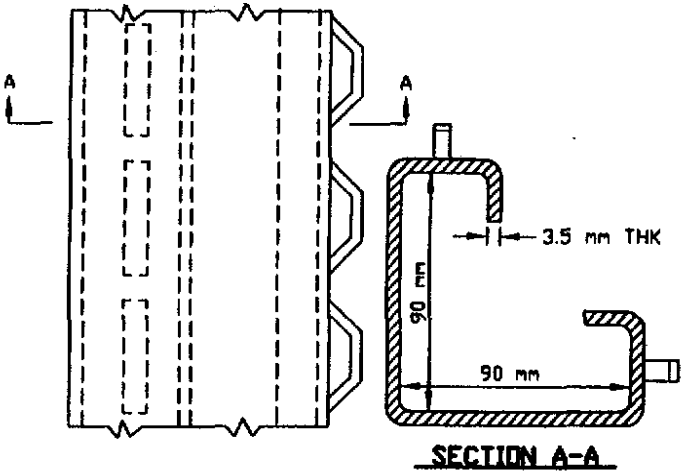


CHAIN LINK FENCE INSTALLATION AT BRIDGES

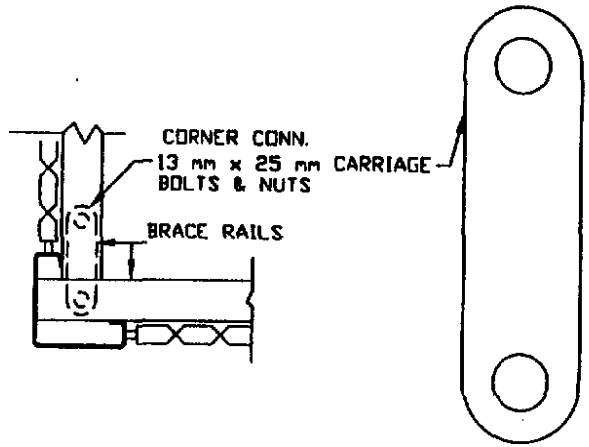




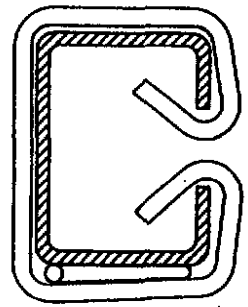
"C" LINE POST



SECTION A-A



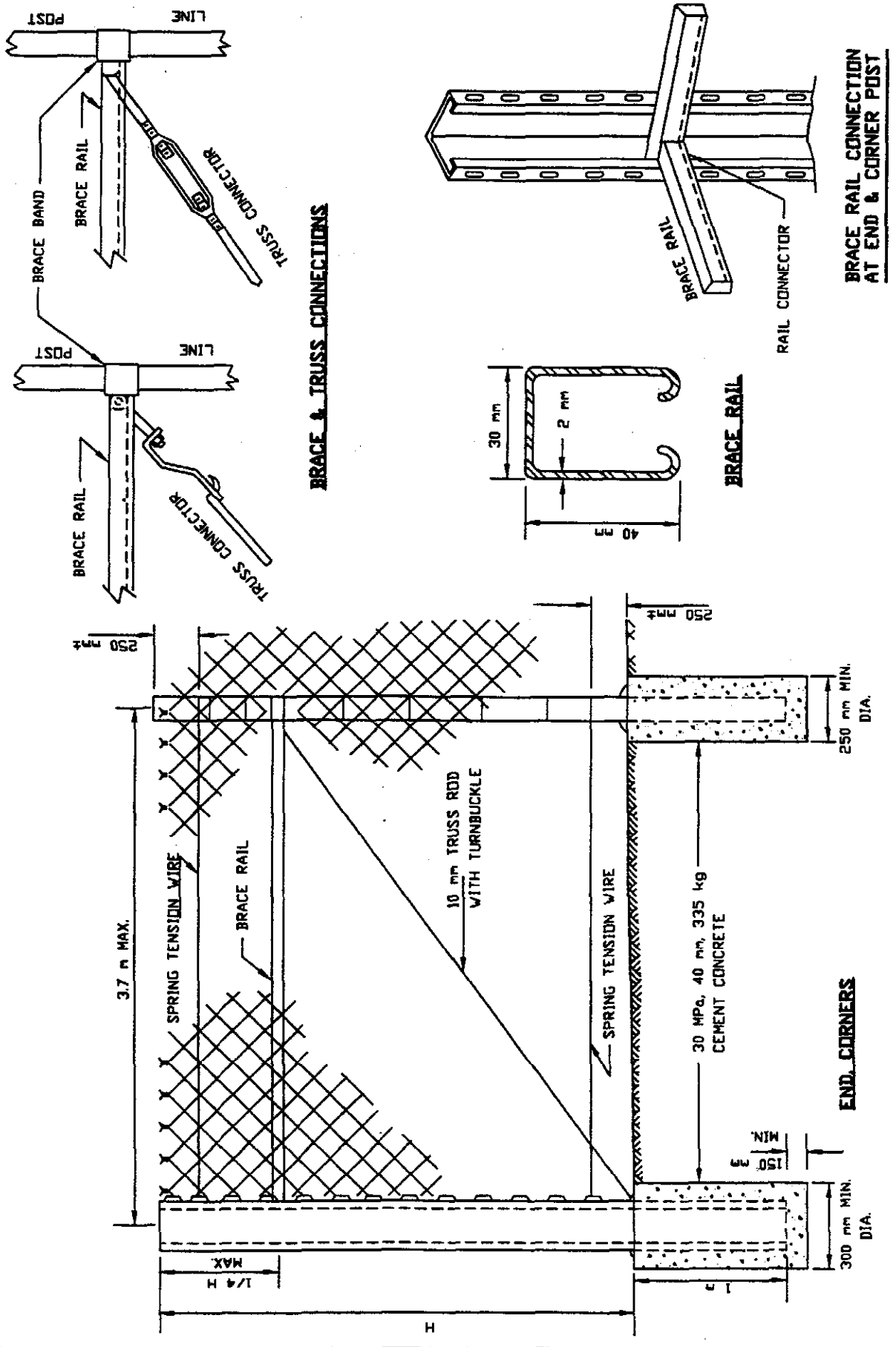
CORNER POST CONNECTION



CLIP FOR "C" LINE POST

NOTE:

1. POSTS ARE TO BE BOLTED ON THE BACK SIDE OF THE END POSTS.

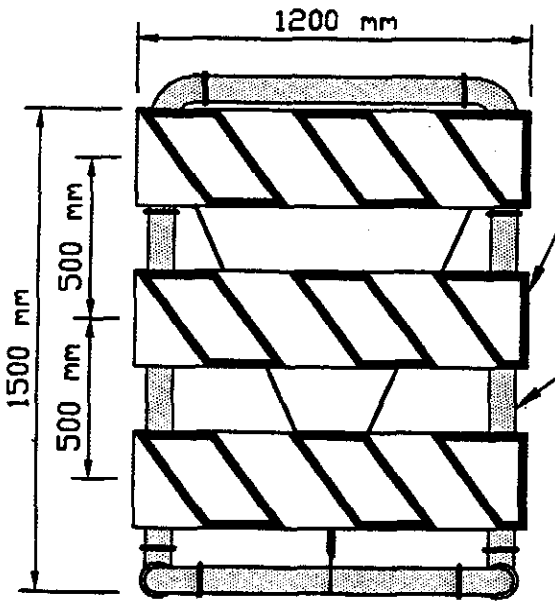


MASS HIGHWAY CONSTRUCTION STANDARDS

CHAIN LINK FENCE POST DETAILS (C-POST)

DATE OF ISSUE 9/22/95

DRAWING NUMBER **404.10.0**

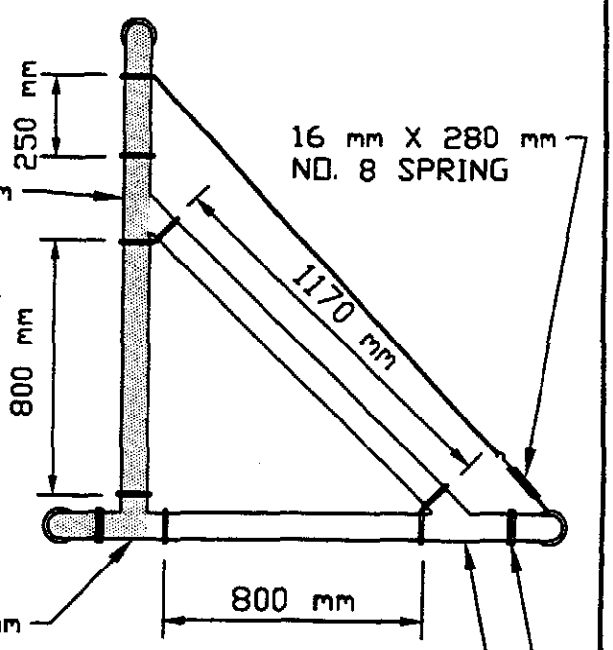


FRONT

TYPICAL 300 mm X 1200 mm X 0.6 mm ANODIZED ALUMINUM PANEL WITH ORANGE & WHITE REFLECTORIZED BARRICADE SHEETING. ATTACH WITH FOUR 25 mm NO. 14 PAN HEAD METAL SCREWS.

80 mm X 80 mm WYE

80 mm PVC PIPE



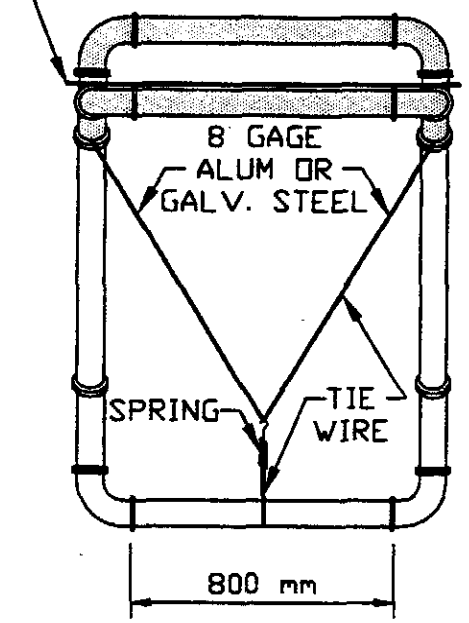
80 mm X 80 mm SANITARY TEE

SIDE

80 mm X 80 mm WYE

80 mm SLEEVES FOR COUPLINGS (TYP.)

REFLECTIVE SHEETING (AS SHOWN ABOVE)



TOP

NOTES:

1. ALL PIPE SHALL BE WHITE, WHITE FITTINGS ARE PREFERRED BLACK MAY BE USED.
2. ALL JOINTS SHALL BE FREE TO SEPARATE UPON VEHICLE IMPACT.
3. SHADED CONDUIT TO BE TIED TOGETHER WITH ROPE THREADED INTO PIPE INTERIOR. USE 5 mm NO. 6 SOLID BRAIDED NYLON OR EQUIVALENT.
4. SANDBAGS SHALL BE USED TO WEIGH DOWN BARRICADE.
5. FOR DESCRIPTION, MATERIALS AND CONSTRUCTION METHOD, SEE STANDARD SPECIFICATIONS.

MASS HIGHWAY CONSTRUCTION STANDARDS

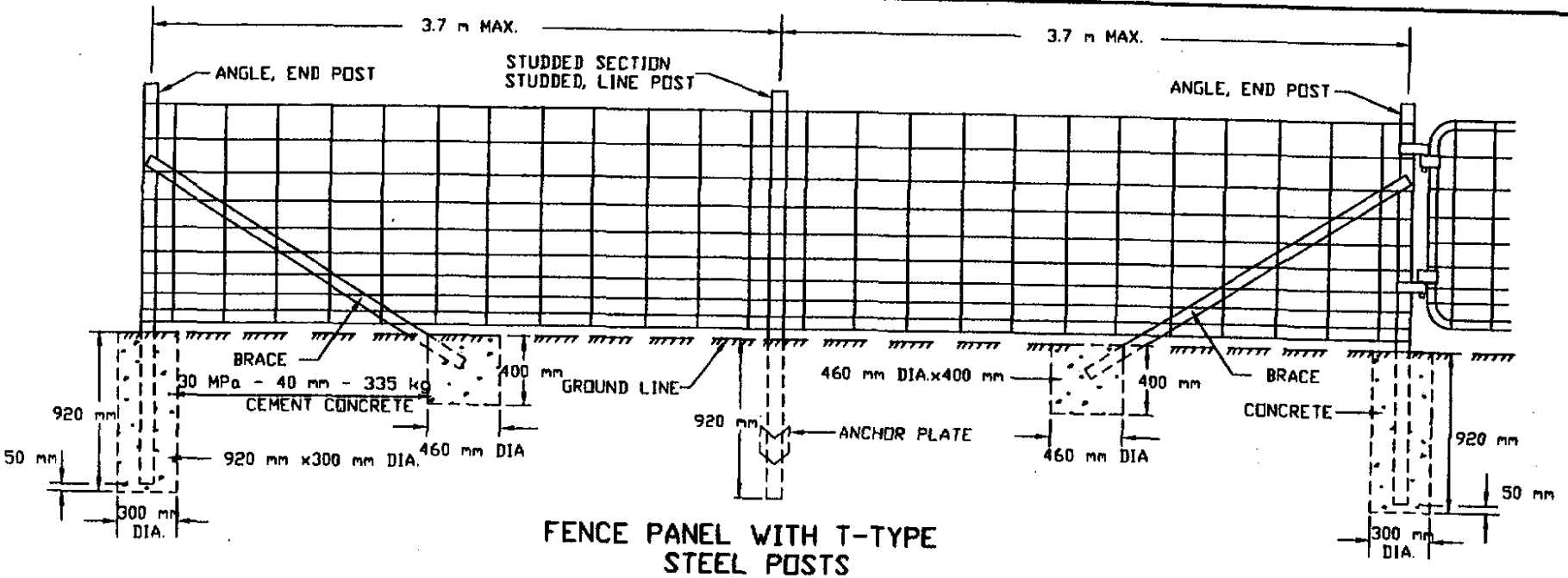
PORTABLE BREAKAWAY BARRICADE TYPE III

DATE OF ISSUE 9/22/95

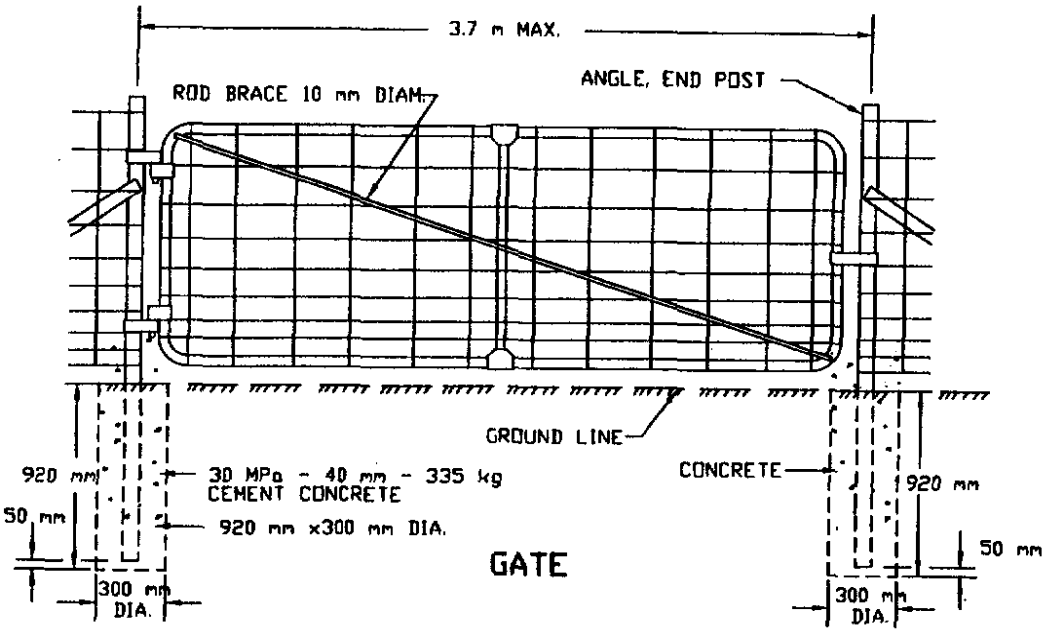
DRAWING NUMBER **406.2.0**

MASS HIGHWAY
CONSTRUCTION STANDARDS

STOCK FENCE



FENCE PANEL WITH T-TYPE STEEL POSTS



GATE

GATE - MINIMUM HEIGHT 1.20 m. FRAME TO BE MADE OF GALVANIZED STEEL TUBING NOT LESS THAN 33 mm O.D. SHELL 2.4 mm THICK.

VERTICAL BRACE NOT LESS THAN 25 mm DIAM.

NOTES:

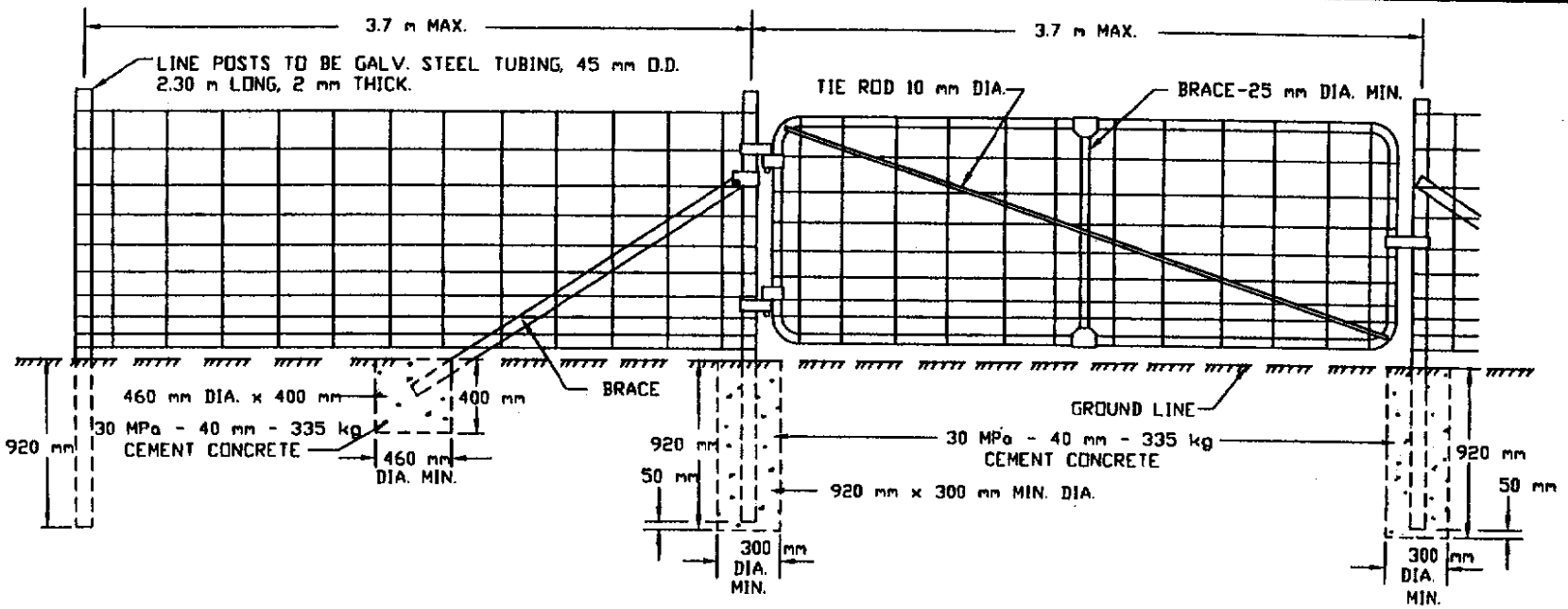
1. ALL CEMENT CONCRETE DIMENSIONS ARE MINIMUMS
2. FOR MATERIALS AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.

DATE OF ISSUE 9/22/95

DRAWING NUMBER 408.1.0

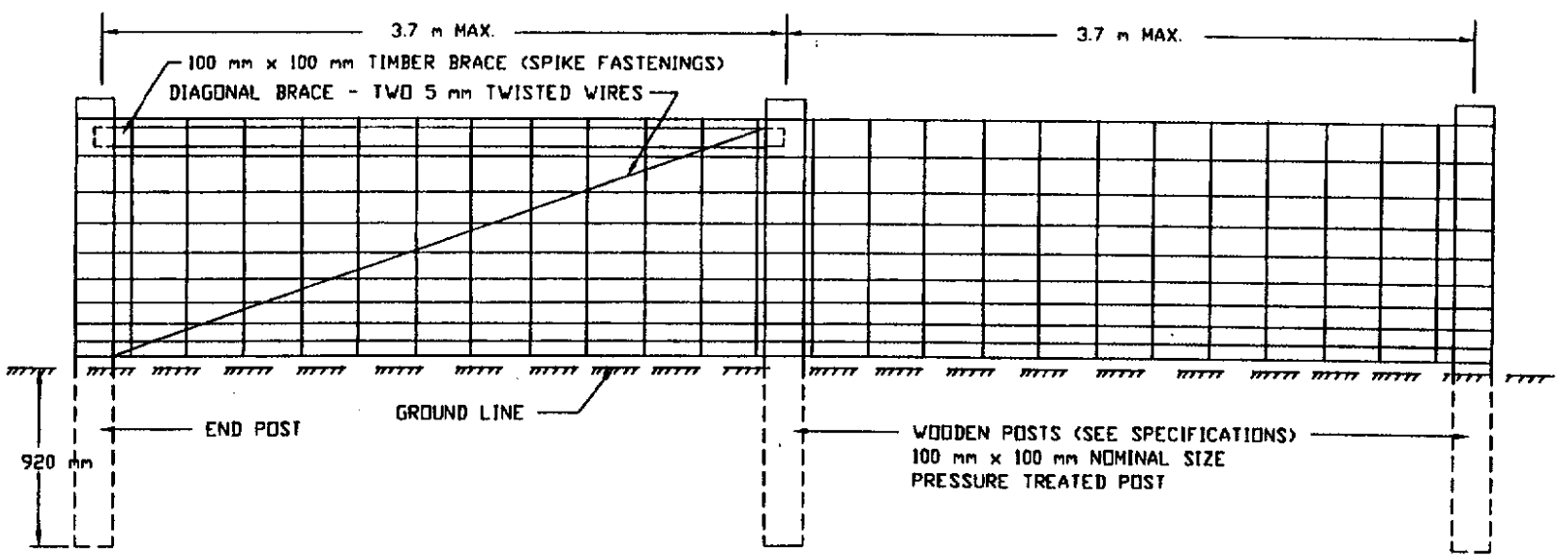
MASS HIGHWAY
CONSTRUCTION STANDARDS

STOCK FENCE



FENCE PANEL WITH POSTS OF STEEL TUBING

NOTE:
1. SEE STANDARD SPECIFICATIONS FOR CONSTRUCTION METHODS AND MATERIALS.



FENCE PANEL WITH WOOD POSTS

DRAWING NUMBER **408.2.0**

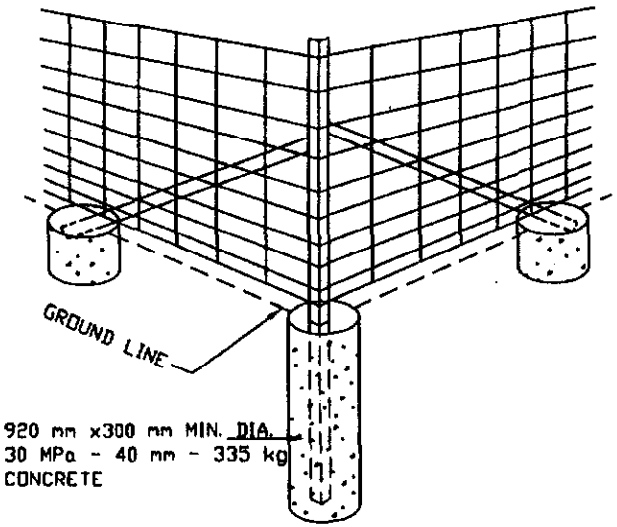
DATE OF ISSUE 9/22/95

MASS HIGHWAY
CONSTRUCTION STANDARDS

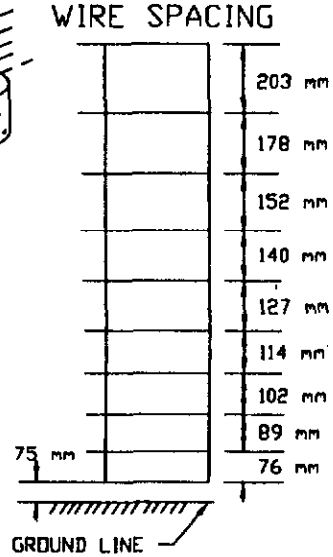
STOCK FENCE

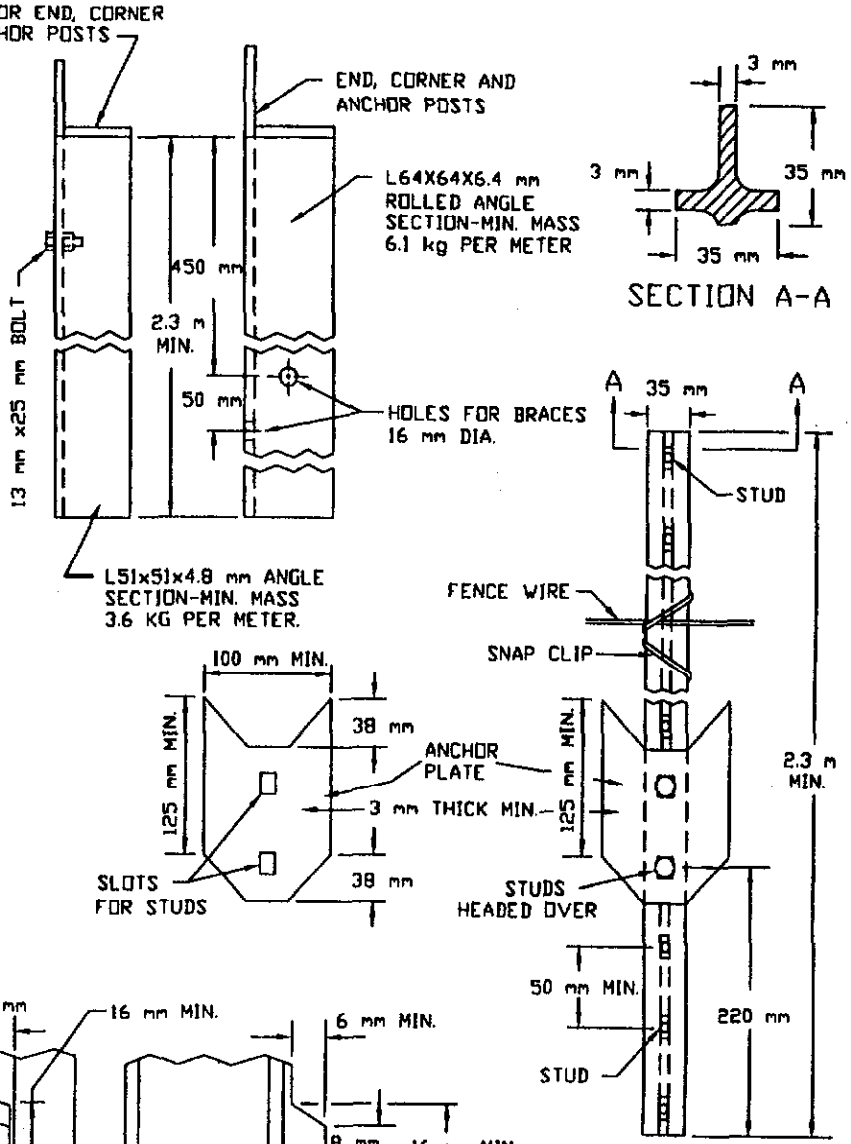
DRAWING NUMBER 408.3.0

DATE OF ISSUE 9/22/95



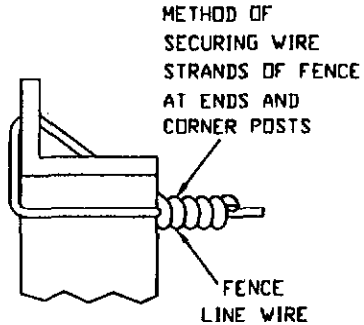
ROLLED ANGLE SECTION FOR END, CORNER AND ANCHOR POSTS

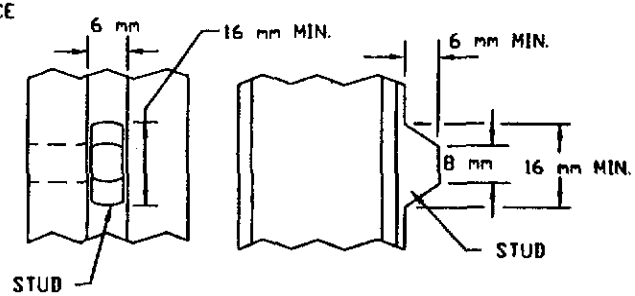




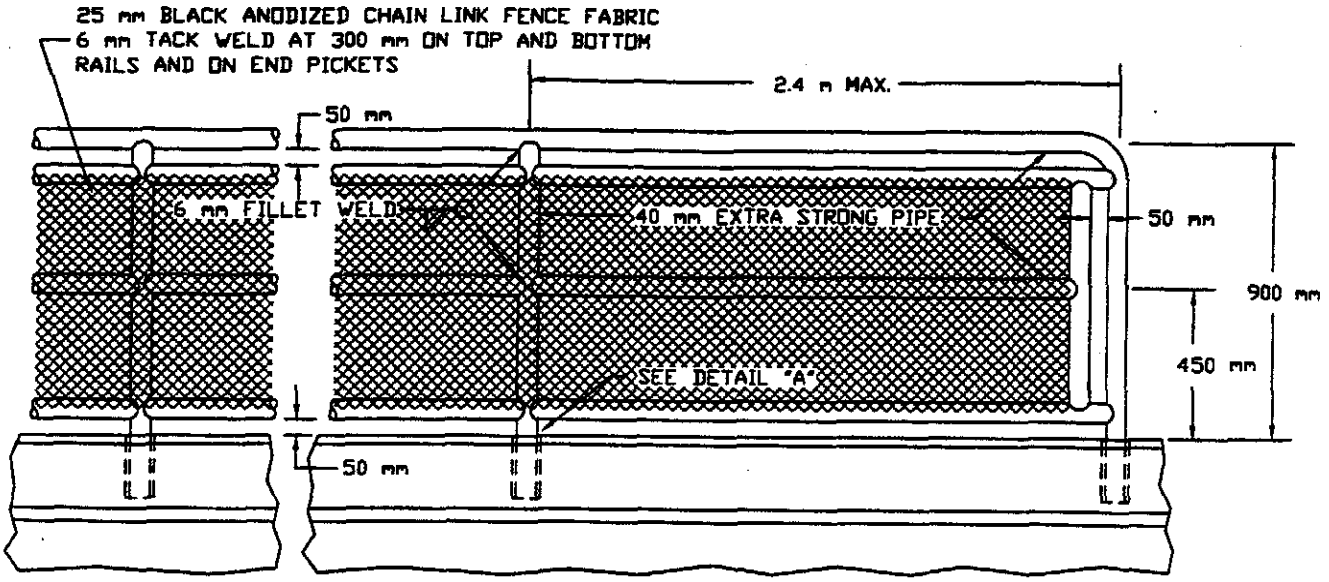
NOTE:

1. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.

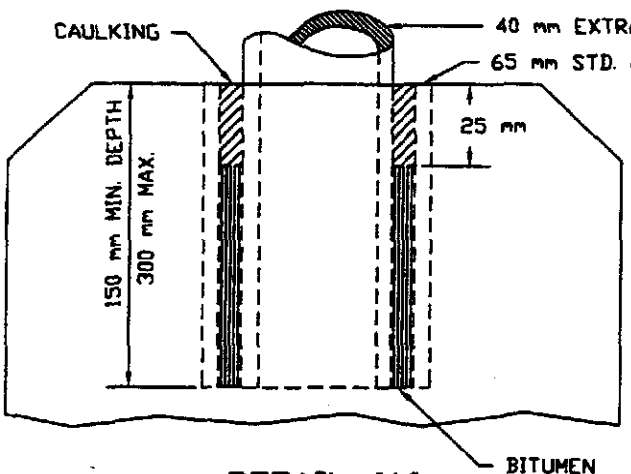




STUDDED "T" SECTION LINE POST



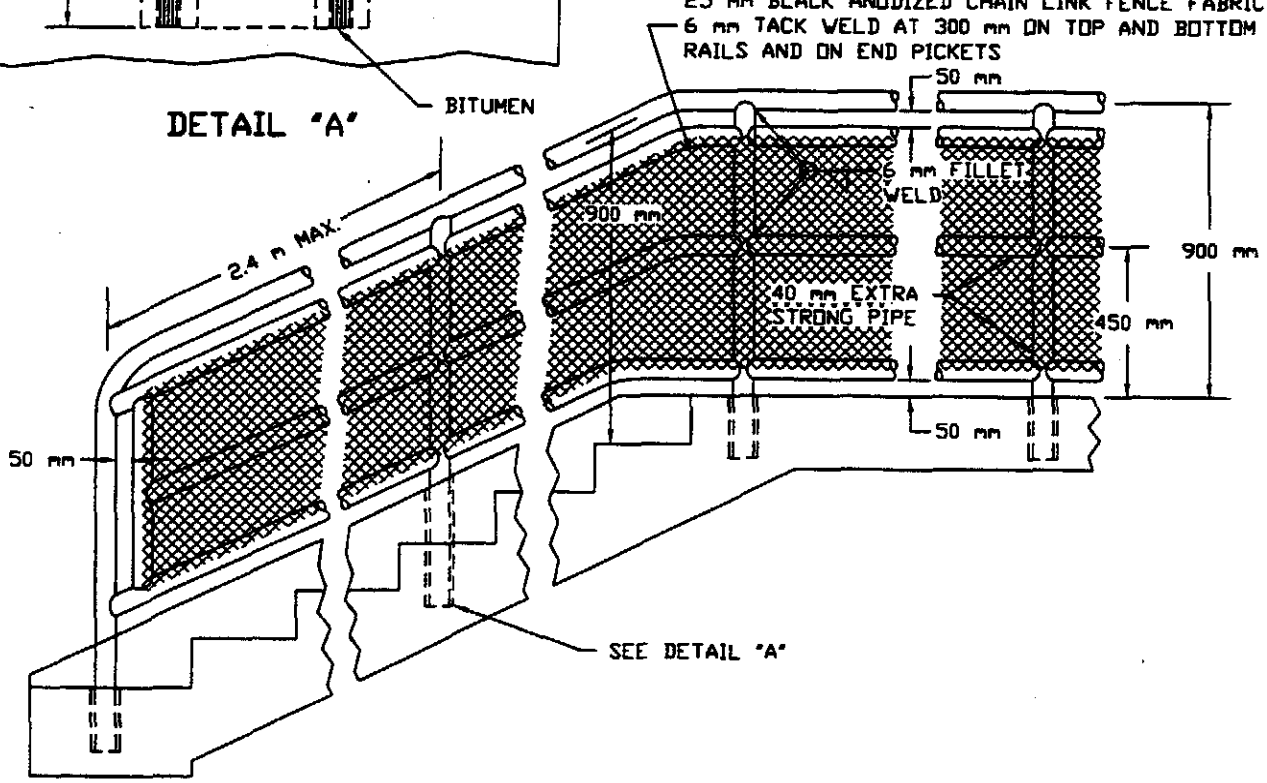
GALVANIZED STEEL PIPE HAND RAIL



DETAIL "A"

NOTES:

1. WHEN USED ON A CURVE ALL RAILINGS TO BE CURVED TO LINE BEFORE ERECTION.
2. GALV. STEEL PIPE FENCE & HAND RAIL TO FOLLOW GRADE OF COPING OR STRUCTURE.
3. STANDARD OR SPECIAL FITTINGS ARE TO BE USED OR JOINTS MAY BE WELDED.
4. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.



MASS HIGHWAY CONSTRUCTION STANDARDS

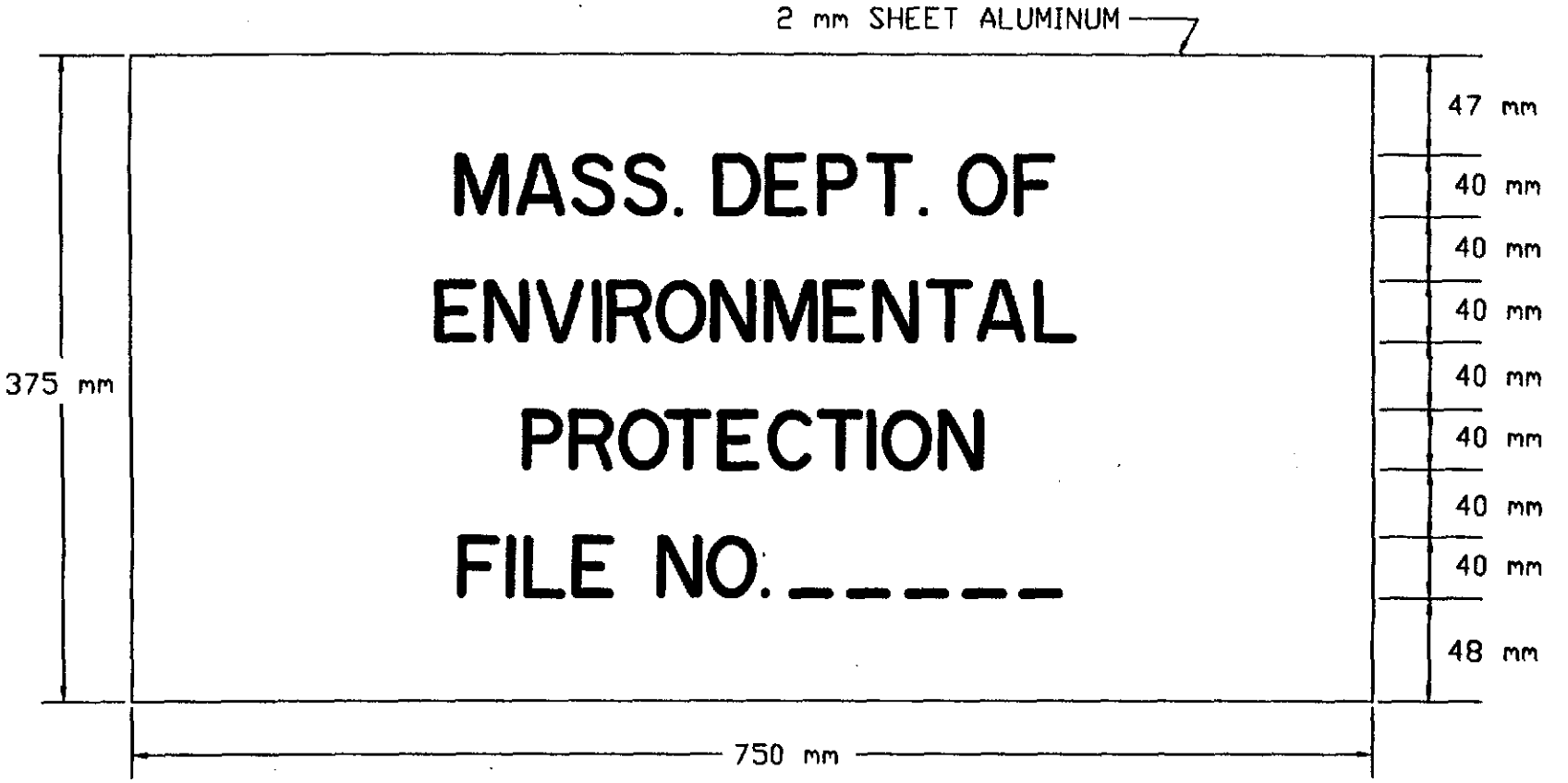
GALVANIZED STEEL PIPE FENCE

DATE OF ISSUE 9/22/95

DRAWING NUMBER **409.1.0**

MASS HIGHWAY CONSTRUCTION STANDARDS

WETLANDS PROTECTION ACT SIGN



COLORS — LEGEND - BLACK (NON-REFLECTORIZED)
BACKGROUND - WHITE (REFLECTORIZED)

THE SIGN IS TO BE MOUNTED ON A MASSACHUSETTS HIGHWAY DEPARTMENT STANDARD "P-5" POST

NOTES:

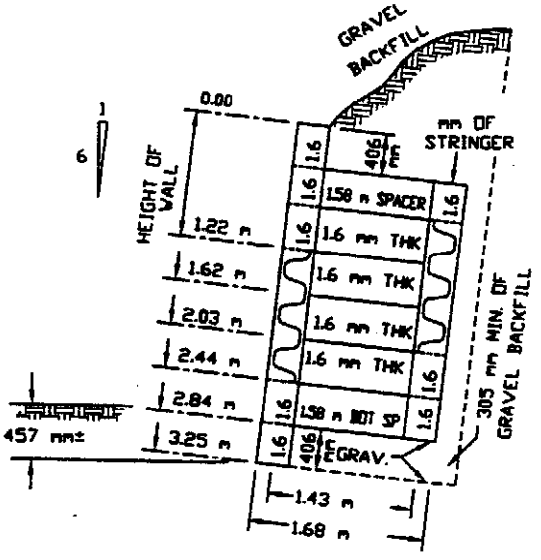
1. THE SIGN IS PLACED ON ALL PROJECTS SUBJECT TO THE PROVISIONS OF THE MASSACHUSETTS WETLANDS PROTECTION ACT.
2. THE LOCATION OF THE SIGN IS TO BE DETERMINED BY THE ENGINEER.
3. SEE SPECIAL PROVISIONS FOR THE MANUFACTURE, MAINTENANCE, ERECTION AND REMOVAL RESPONSIBILITIES.
4. USE SERIES "D" FOR LETTERING.

DATE OF ISSUE 9/22/95

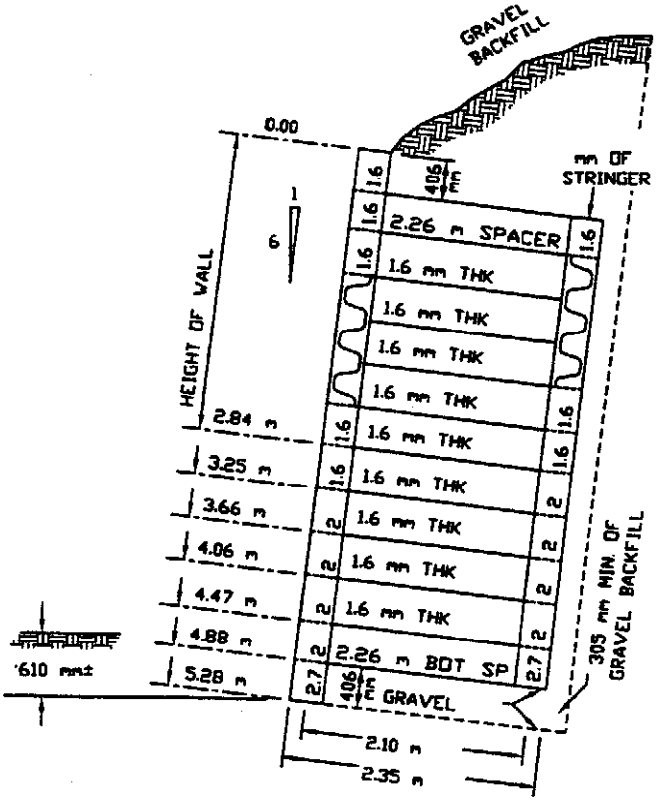
DRAWING NUMBER **501.1.0**

FOR NEW WALLS

PROPRIETARY WALL SYSTEMS: FOR SELECTION AND DESIGN OF NEW PROPRIETARY WALL SYSTEMS CONTACT THE GEOTECHNICAL SECTION OF THE MASSACHUSETTS HIGHWAY DEPARTMENT. NEW PROPRIETARY WALL SYSTEMS WILL BE SELECTED AND DESIGNED TO FIT SITE CONDITIONS.



DESIGN "A"



DESIGN "B"

NOTES:

1. THESE DEPTHS MAY VARY TO SUIT CONDITIONS.
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

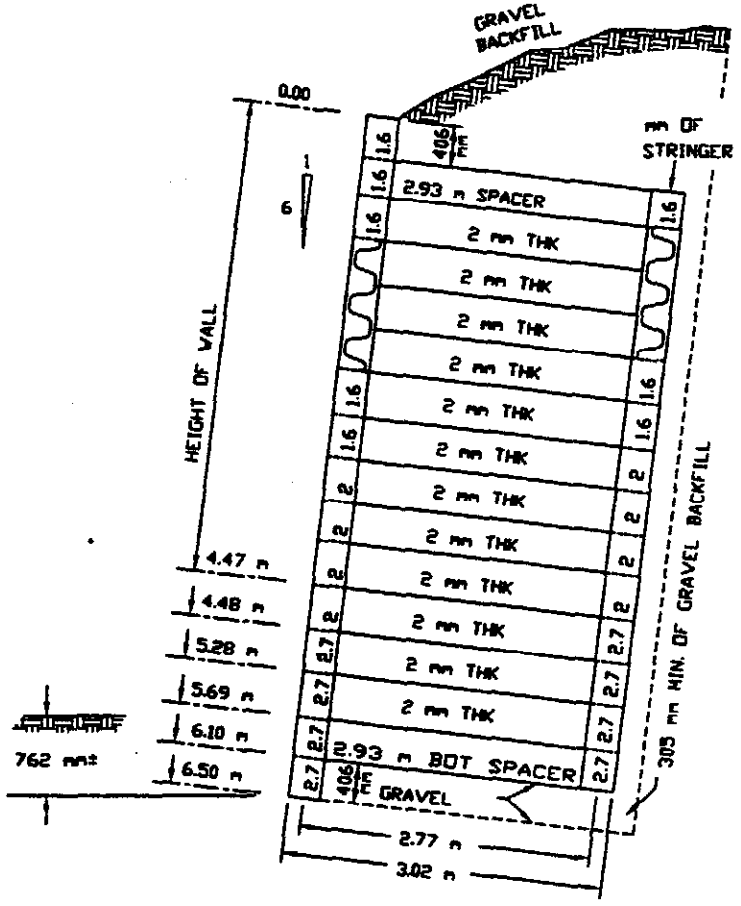
REPAIR TO EXISTING WALLS ONLY

MASS HIGHWAY CONSTRUCTION STANDARDS

METAL BIN-TYPE RETAINING WALL
DESIGNS "A" AND "B"

DATE OF ISSUE
9/22/95

DRAWING NUMBER
503.1.1



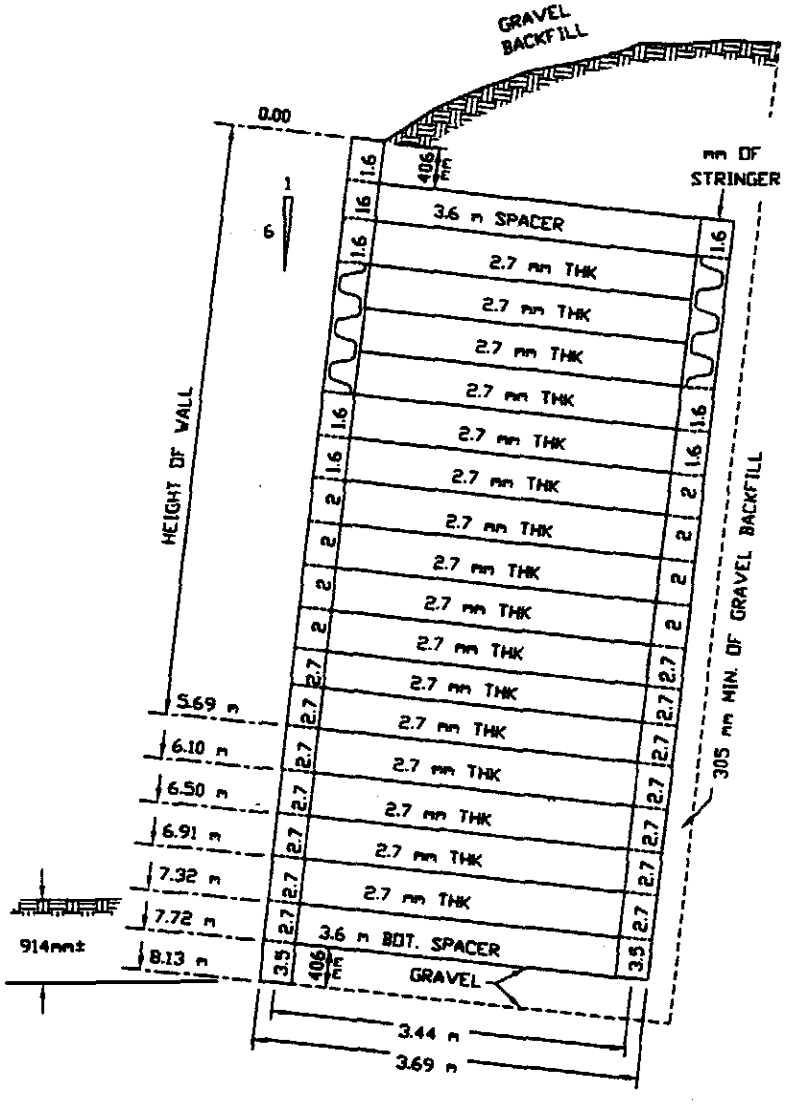
DESIGN "C"

NOTES:

1. THESE DEPTHS MAY VARY TO SUIT CONDITIONS.
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

REPAIR TO EXISTING WALLS ONLY

MASS HIGHWAY CONSTRUCTION STANDARDS	METAL BIN-TYPE RETAINING WALL DESIGN "C"	DATE OF ISSUE 9/22/95
		DRAWING NUMBER 503.1.2



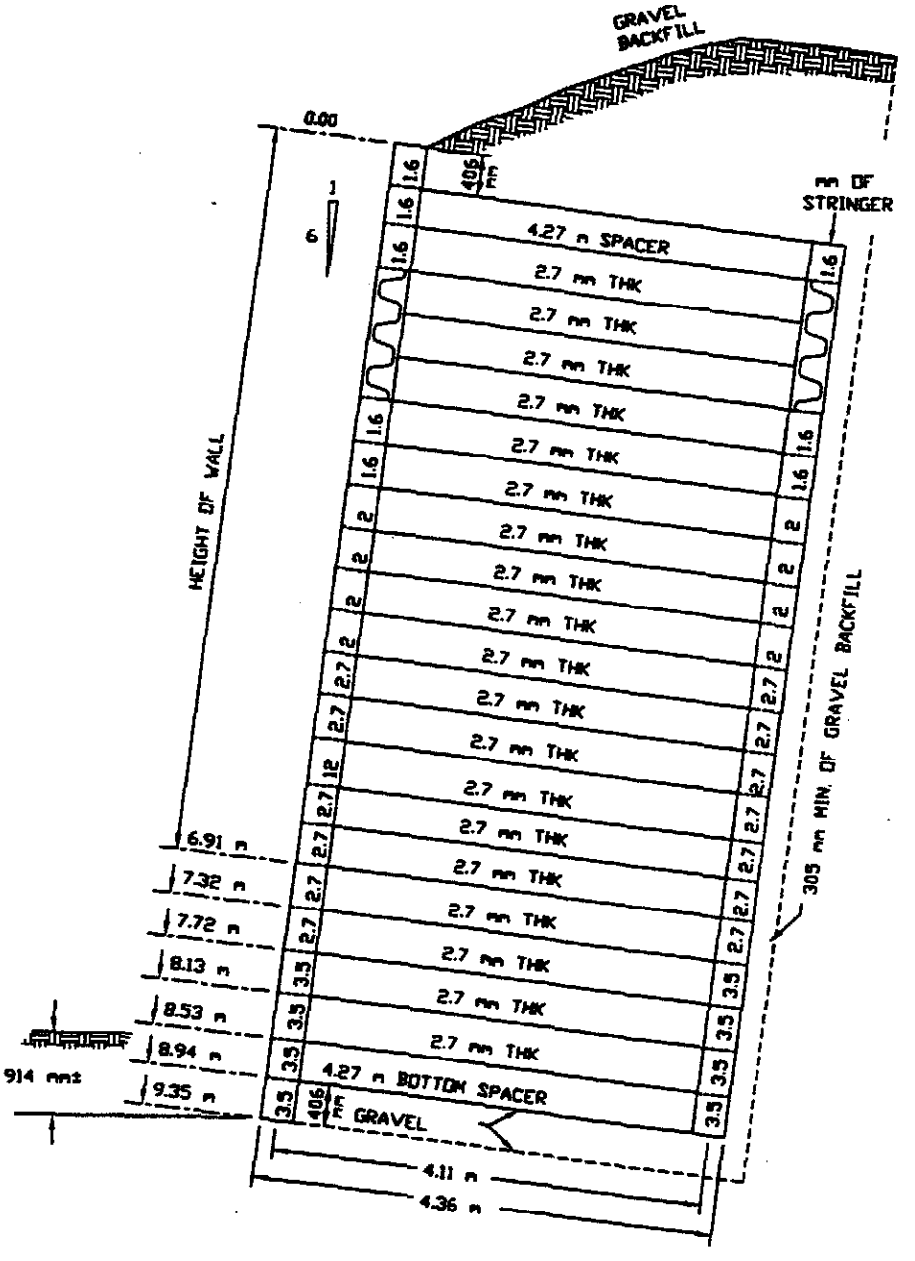
DESIGN "D"

NOTES:

1. THESE DEPTHS MAY VARY TO SUIT CONDITIONS.
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

REPAIR TO EXISTING WALLS ONLY

MASS HIGHWAY CONSTRUCTION STANDARDS	METAL BIN-TYPE RETAINING WALL DESIGN "D"	DATE OF ISSUE 9/22/95
		DRAWING NUMBER 503.1.3



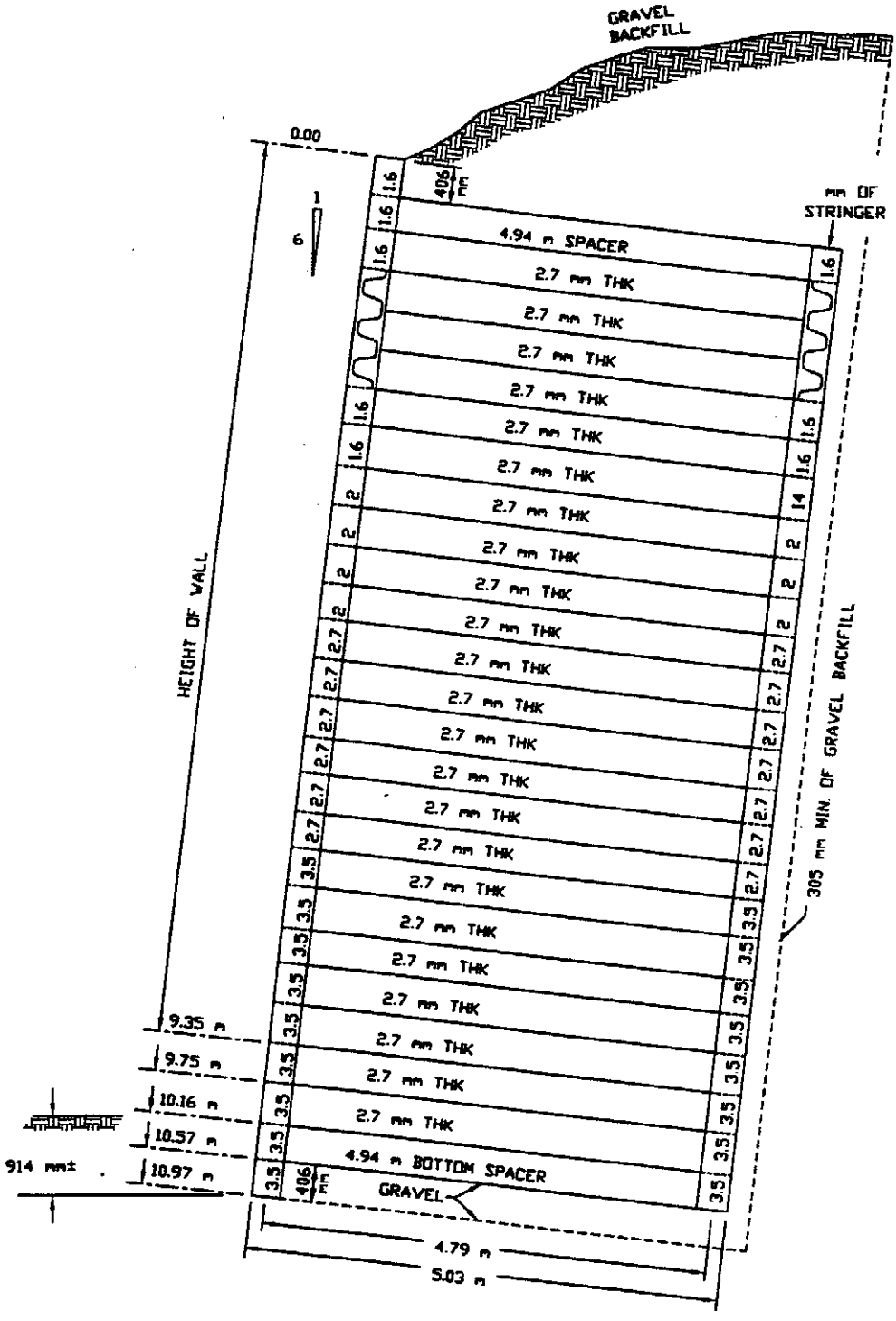
DESIGN "E"

NOTES:

1. THESE DEPTHS MAY VARY TO SUIT CONDITIONS.
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

REPAIR TO EXISTING WALLS ONLY

MASS HIGHWAY CONSTRUCTION STANDARDS	METAL BIN-TYPE RETAINING WALL DESIGN "E"	DATE OF ISSUE 9/22/95 DRAWING NUMBER 503.1.4



DESIGN "F"

NOTES:

1. THESE DEPTHS MAY VARY TO SUIT CONDITIONS.
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

REPAIR TO EXISTING WALLS ONLY

MASS HIGHWAY CONSTRUCTION STANDARDS

METAL BIN-TYPE RETAINING WALL
DESIGN "F"

DATE OF ISSUE
9/22/95

DRAWING NUMBER
503.1.5

TABLE 1

LOADING CONDITION

$$R = \frac{\text{WALL THICKNESS}}{\text{WALL HEIGHT}} = \frac{D}{H}$$

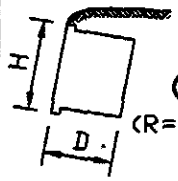
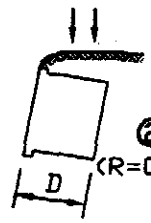
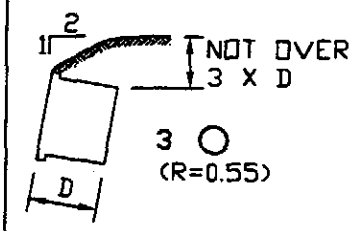
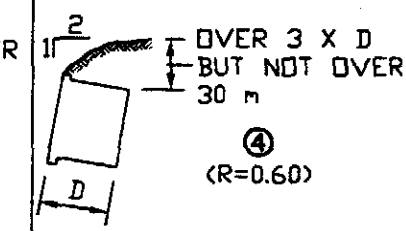
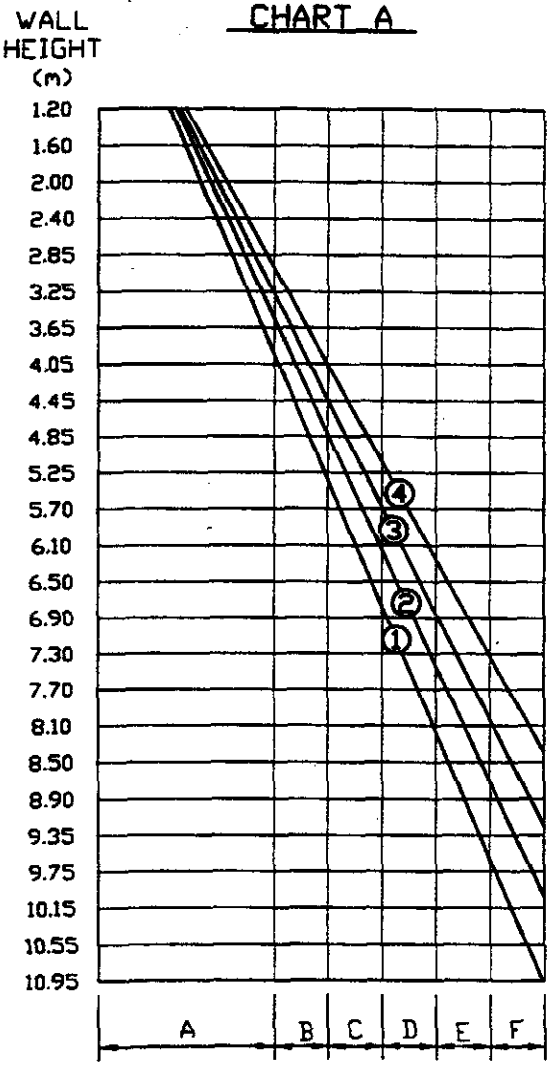
BATTER	LEVEL	SLIGHT WITH SUPERIMPOSED LOAD	SLOPING TO 3 X D	SLOPING ABOVE 3 X D
WALL ON 6V : 1H BATTER	 ① (R=0.45)	 ② (R=0.50)	 3 ○ (R=0.55)	 ④ (R=0.60)

CHART A



WALL DESIGN

REPAIR TO EXISTING WALLS ONLY

MASS HIGHWAY CONSTRUCTION STANDARDS

METAL BIN-TYPE RETAINING WALL DESIGN CHART

DATE OF ISSUE 9/22/95

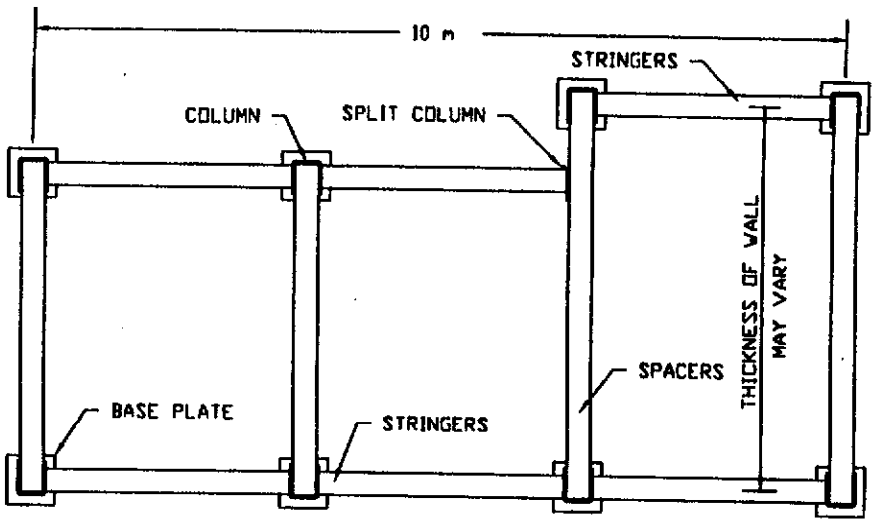
DRAWING NUMBER **503.1.6**

MASS HIGHWAY
CONSTRUCTION STANDARDS

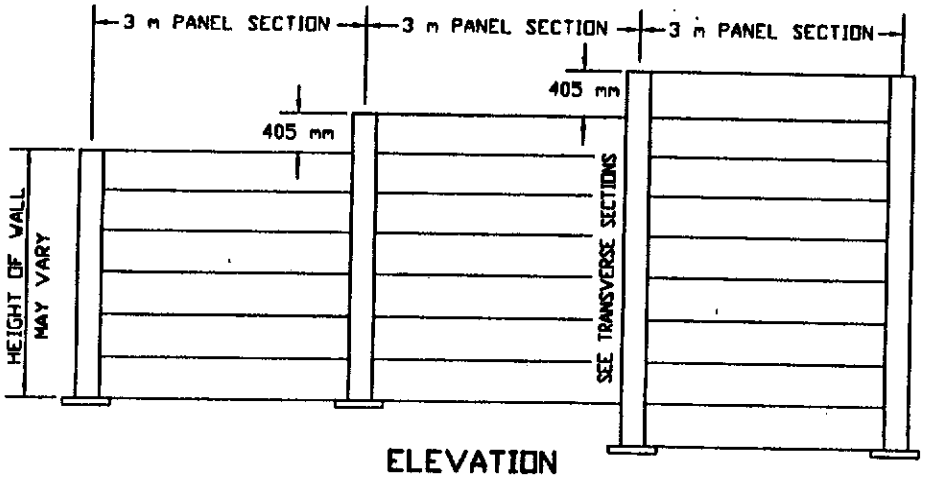
METAL BIN-TYPE RETAINING WALL

DRAWING NUMBER
503.2.0

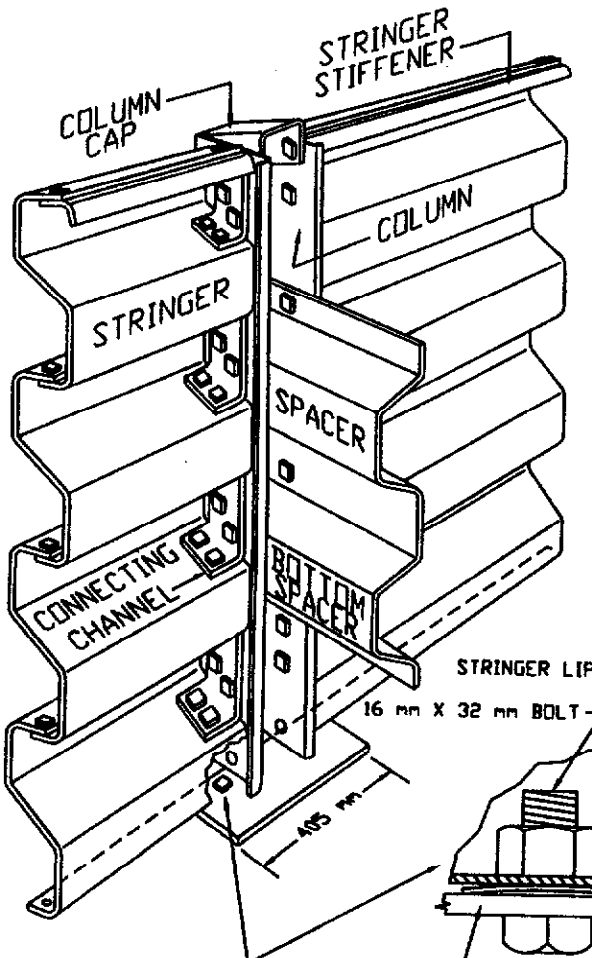
DATE OF ISSUE
9/22/95



PLAN

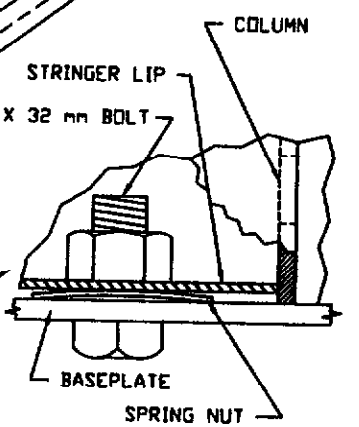


ELEVATION



BIN ASSEMBLY AT FRONT COLUMN

(SIMILAR AT REAR COLUMN)



NOTES:

1. ALL NUTS AND BOLTS TO BE GALVANIZED.
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECFICATIONS.

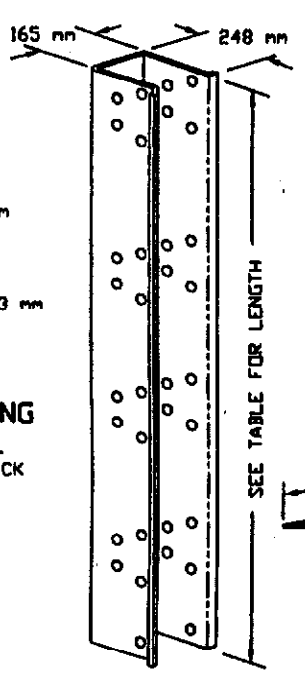
REPAIR TO EXISTING WALLS ONLY

MASS HIGHWAY
CONSTRUCTION STANDARDS

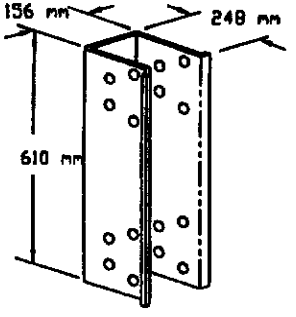
METAL BIN - TYPE RETAINING WALL

DRAWING NUMBER
503.3.0

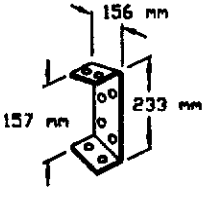
DATE OF ISSUE
9/22/95



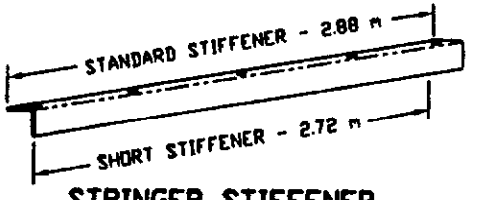
COLUMN
4.2 mm THICK



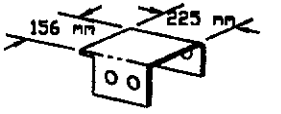
COLUMN SPLICE PLATE
3.5 mm THICK



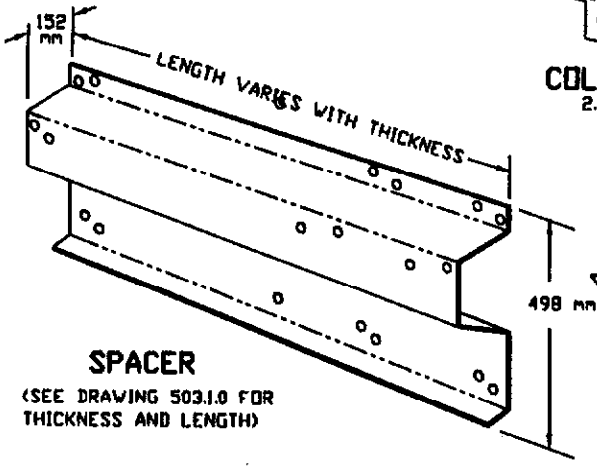
CONNECTING CHANNEL
4.2 mm THICK



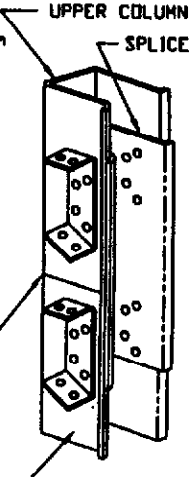
STRINGER STIFFENER
4.2 mm THICK

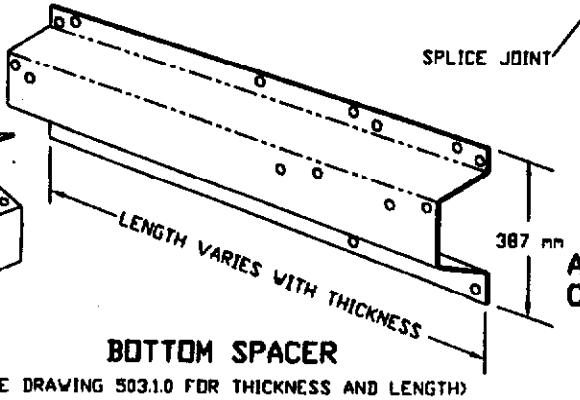


COLUMN CAP
2.7 mm THICK



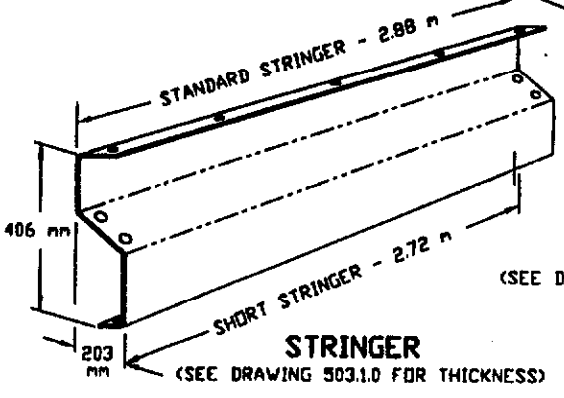
SPACER
(SEE DRAWING 503.1.0 FOR THICKNESS AND LENGTH)



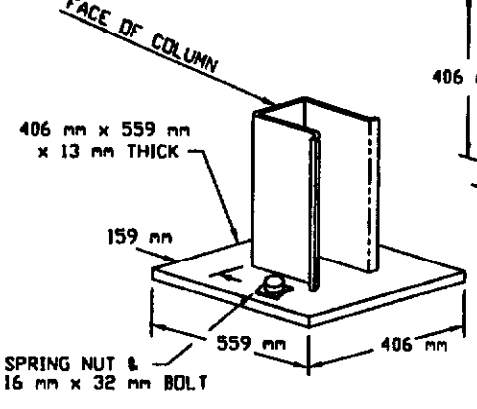


BOTTOM SPACER
(SEE DRAWING 503.1.0 FOR THICKNESS AND LENGTH)

ASSEMBLY AT COLUMN SPLICE



STRINGER
(SEE DRAWING 503.1.0 FOR THICKNESS)



BASE PLATE ARRANGEMENT

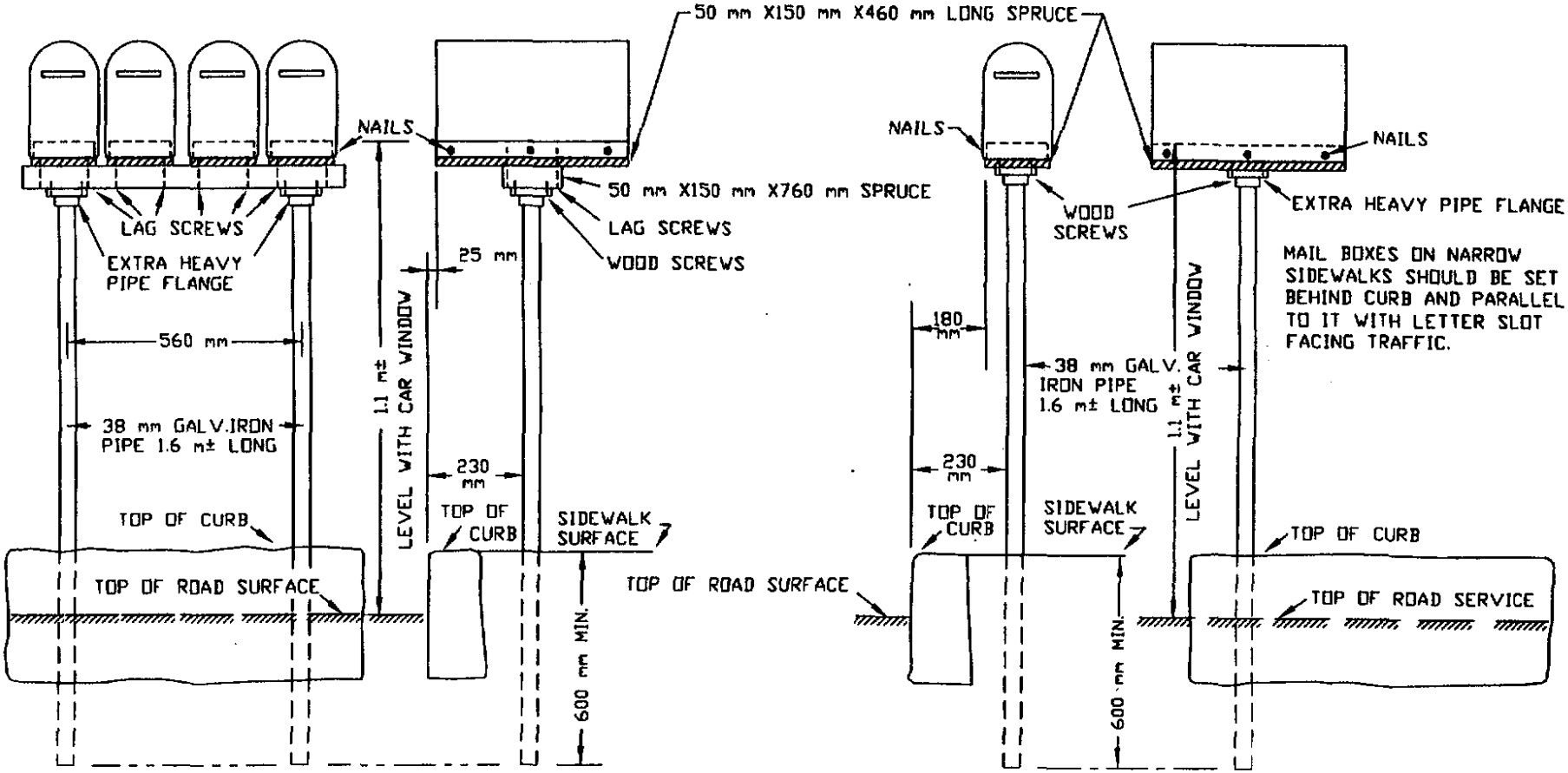
REPAIR TO EXISTING WALLS ONLY

NOTES:
1. ALL NUTS & BOLTS TO BE GALVANIZED
2. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.

ALL OF THE ABOVE AND ADDITIONAL REQUIREMENTS IN THE MANUFACTURE AND ERECTION OF THE RETAINING WALL AS STATED IN THE STANDARD SPECIFICATIONS FOR SAME SHALL BE STRICTLY ADHERED TO.

MASS HIGHWAY CONSTRUCTION STANDARDS

SETTING RURAL MAILBOXES



NOTES:

1. LUMBER TO BE PLANED ON ALL FOUR SIDES TO FULL 50 mm x 150 mm SIZE TO FIT BOTTOM OF MAIL BOXES.
2. TO SET 38 mm GALVANIZED PIPE POST, USE DRIVING POINT OF SAME SIZE, THEN TAMP POST INTO PLACE SO AS TO BE PLUMB BOTH WAYS.
3. ALL FITTINGS (PIPE FLANGES, PIPE, SCREWS, NAILS, ETC.) ARE TO BE GALVANIZED.
4. FOR DESCRIPTIONS, MATERIALS, AND CONSTRUCTIONS METHODS SEE STANDARD SPECIFICATIONS.

DATE OF ISSUE 9/22/95

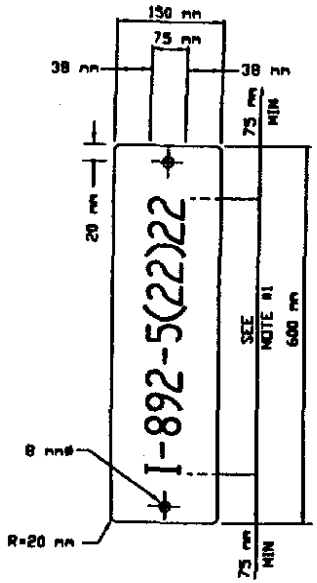
DRAWING NUMBER 504.1.0

MASS HIGHWAY
CONSTRUCTION STANDARDS

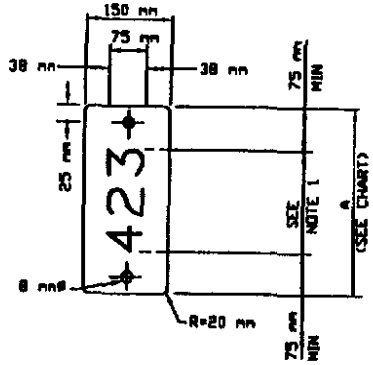
DEMOUNTABLE STATION MARKER AND PROJECT MARKER

DATE OF ISSUE 9/22/95

DRAWING NUMBER 505.1.0



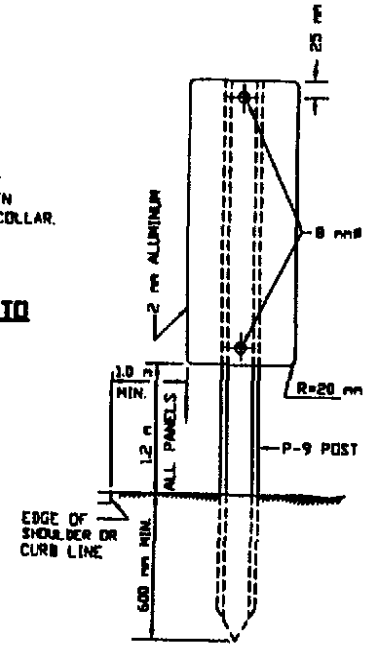
PROJECT MARKER PANEL



# OF DIGITS	A (mm)
1	200
2	275
3	325

STATION MARKER PANEL

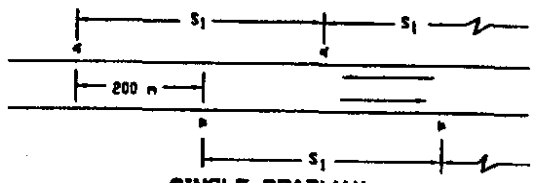
METHOD OF ATTACHING PANEL TO P-9 POST



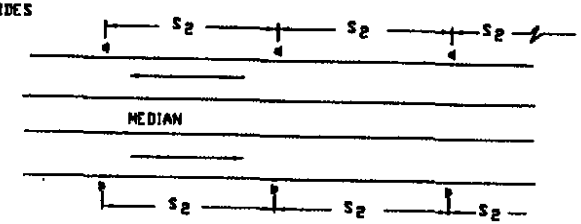
TYPICAL MARKER INSTALLATION

SPACING OF STATION NUMBERS

S_1 - 400 m BOTH SIDES, STAGGER
S_2 - 200 m BOTH SIDES

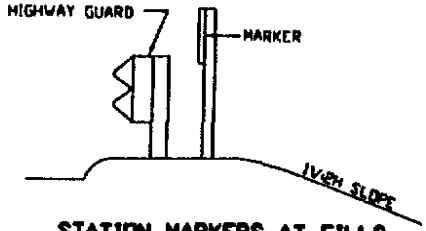


SINGLE ROADWAY

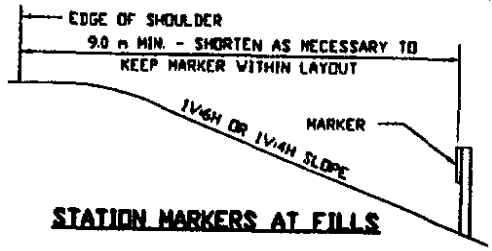


DIVIDED ROADWAY

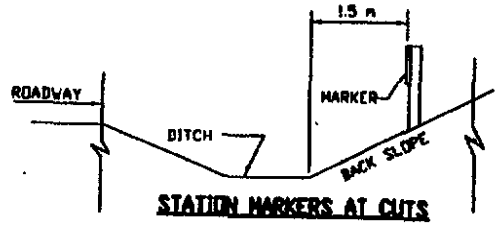
OMIT MARKERS FROM INTERCHANGE



STATION MARKERS AT FILLS



STATION MARKERS AT FILLS



STATION MARKERS AT CUTS

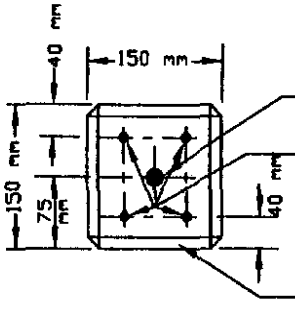
NOTES:
1. THE LEGEND IS TO BE CENTERED AND THE SPACING OF THE CHARACTERS IS TO CONFORM TO THE FEDERAL HIGHWAY ADMINISTRATION RECOMMENDATION FOR SERIES "C" TYPE LETTERING.
2. THE STATION DESIGNATIONS ARE TO BE EVEN STATIONS i.e. NO PLUS STATIONS.
3. THE PANELS FOR THE LEGEND ARE TO BE 2 mm SHEET ALUMINUM. FABRICATED AND FINISHED ACCORDING TO THE STANDARD SPECIFICATIONS.
4. THE LETTERS AND NUMERALS AND METHOD OF APPLICATIONS ARE DESCRIBED IN THE STANDARD SPECIFICATIONS.
5. ALL PANELS ARE TO BE MOUNTED ON NEW P-9 POST IN THE MANNER DESCRIBED IN THE STANDARD SPECIFICATIONS.
6. ONE MARKER IS TO BE PROVIDED AT CULVERT END, WHERE NO GUARD RAIL IS INSTALLED IT IS TO BE LOCATED AT THE NEAR BACK CORNER OF THE END IN THE DIRECTION OF TRAFFIC.
7. MARKERS ARE TO BE PLACED AT 200 m INTERVALS) ON UNDIVIDED ROADWAY STAGGER ON EACH SIDE, ON DIVIDED ROADWAY PLACE MARKERS OPPOSITE EACH OTHER.
8. SEE DRAWING TR.2.3 FOR P-9 POST DIMENSIONS.

MASSHIGHWAY
CONSTRUCTION STANDARDS

BOUNDS

DRAWING NUMBER
506.1.0

DATE OF ISSUE
9/22/95



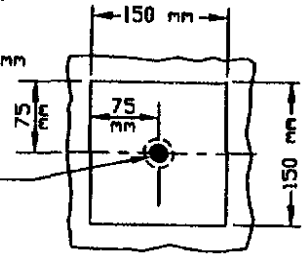
30 MPa - 20 mm - 390 kg CEMENT CONCRETE SHALL BE USED FOR CONC. BOUNDS.

CIRCULAR LEAD PLUG 50 mm LONG CAST IN CENTER OF BOUND, 13 mm DIAM. AT TOP AND 16 mm DIAM. AT BOTTOM.

4 # 10 STEEL REINF. BARS

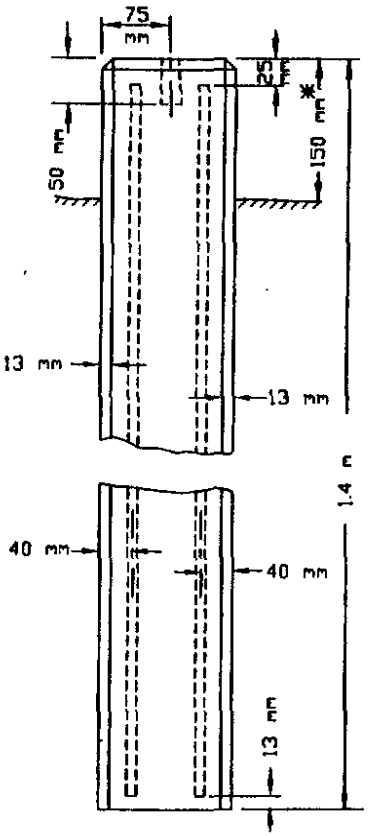
13 mm DIAM. HOLE IN CENTER OF TOP, 40 mm DEEP, FLARED AT BOTTOM, RAMMED WITH LEAD ROPE.

CONCRETE BOUNDS

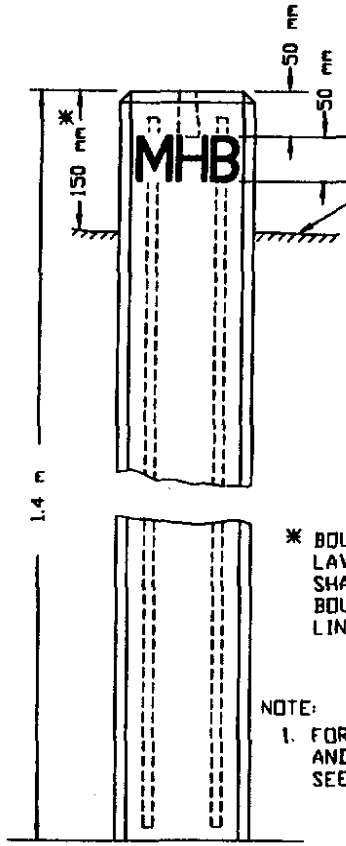


TOP AND TOP 300 mm ON THREE SIDES TO BE POINTED. TOP 300 mm ON FACE TO BE HAMMER DRESSED.

GRANITE BOUNDS

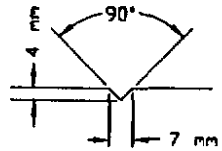


PLAIN



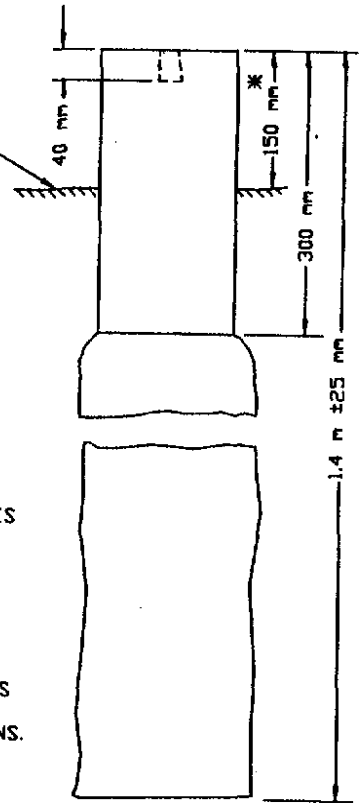
LETTERED

SECTION THRU LETTER

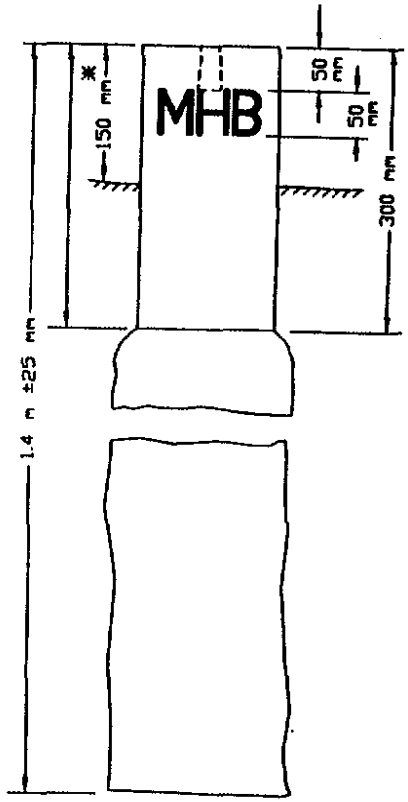


* BOUNDS TO BE LOCATED IN LAWNS, SIDEWALKS OR DRIVES SHALL BE SET WITH TOP OF BOUND 50 mm BELOW GROUND LINE.

NOTE:
1. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS, SEE STANDARD SPECIFICATIONS.



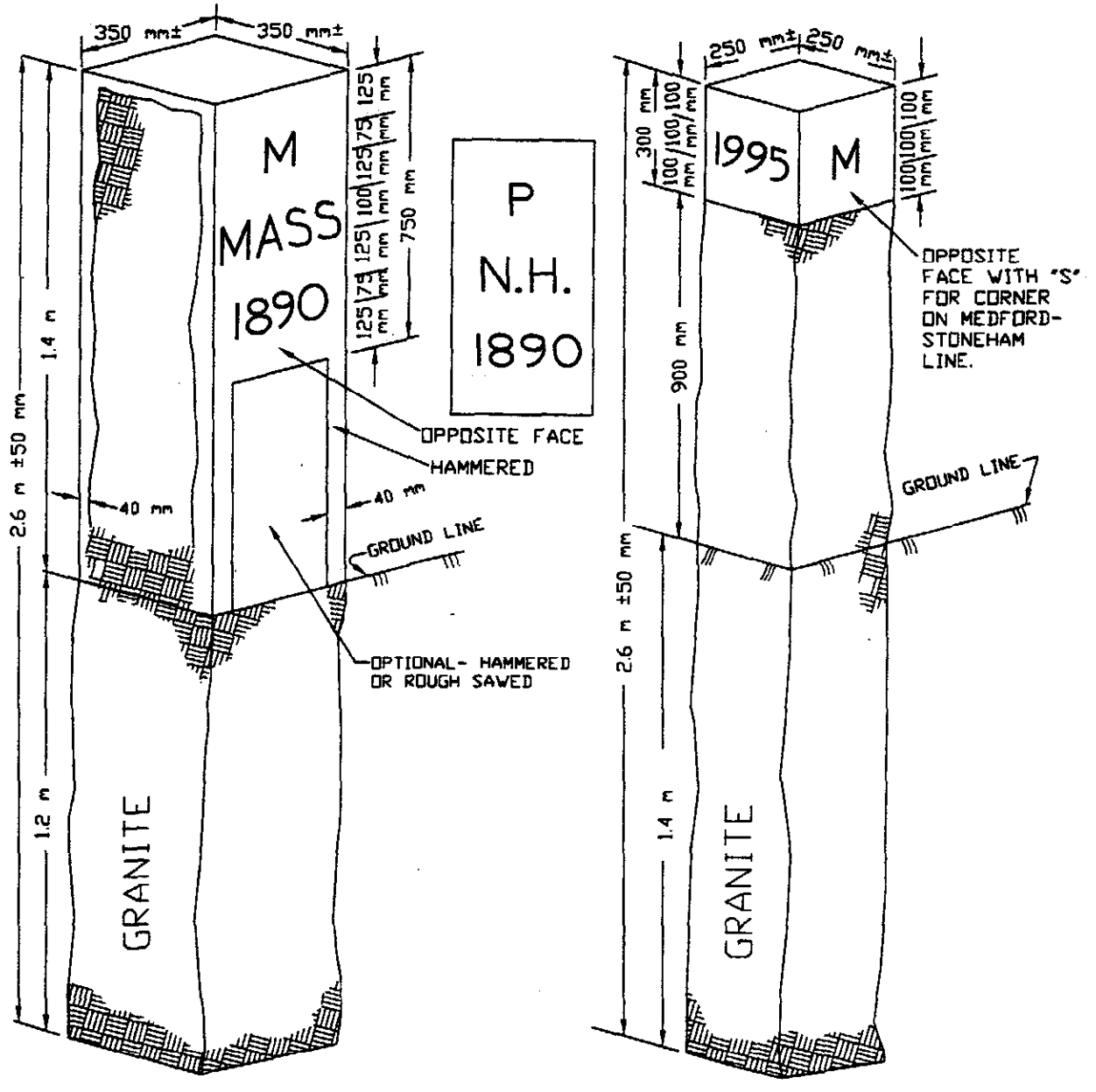
PLAIN



LETTERED

REPLACEMENT OF BOUND BROKEN OR LOST WILL BE INSCRIBED WITH THE YEAR BOUND POINT WAS ESTABLISHED.
BOUNDS LOCATING NEW CORNERS WILL BE INSCRIBED WITH THE YEAR NEW CORNER WAS ESTABLISHED.

ALL LETTERING TO BE
13mm V SUNK LETTERS



STATE LINE

CITY OR TOWN CORNER

NOTES:

1. TOP AND 4 SIDES FOR A DISTANCE OF 300 mm TO BE HAMMERED SMOOTH.
2. IN SPECIFIED LOCATIONS, MONUMENTS MAY BE HAMMERED SMOOTH ON TOP AND 4 SIDES ABOVE GROUND LINE.
3. FOR DESCRIPTIONS, MATERIALS AND CONSTRUCTION METHODS SEE STANDARD SPECIFICATIONS.

MASS HIGHWAY CONSTRUCTION STANDARDS

STONE MONUMENTS
(BOUNDS)

DATE OF ISSUE 9/22/95

DRAWING NUMBER **506.2.0**

TRAFFIC

SIGNS AND SUPPORTS

MASS HIGHWAY
SIGNS & SUPPORTS

DESCRIPTION	DRAWING NUMBER

GENERAL NOTES

THE SIGNS, FOUNDATIONS, AND SUPPORTS SHALL BE FABRICATED AND ERECTED TO CONFORM WITH THE FOLLOWING:

THE DEPARTMENT'S STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES (1995 edition and as subsequently amended).

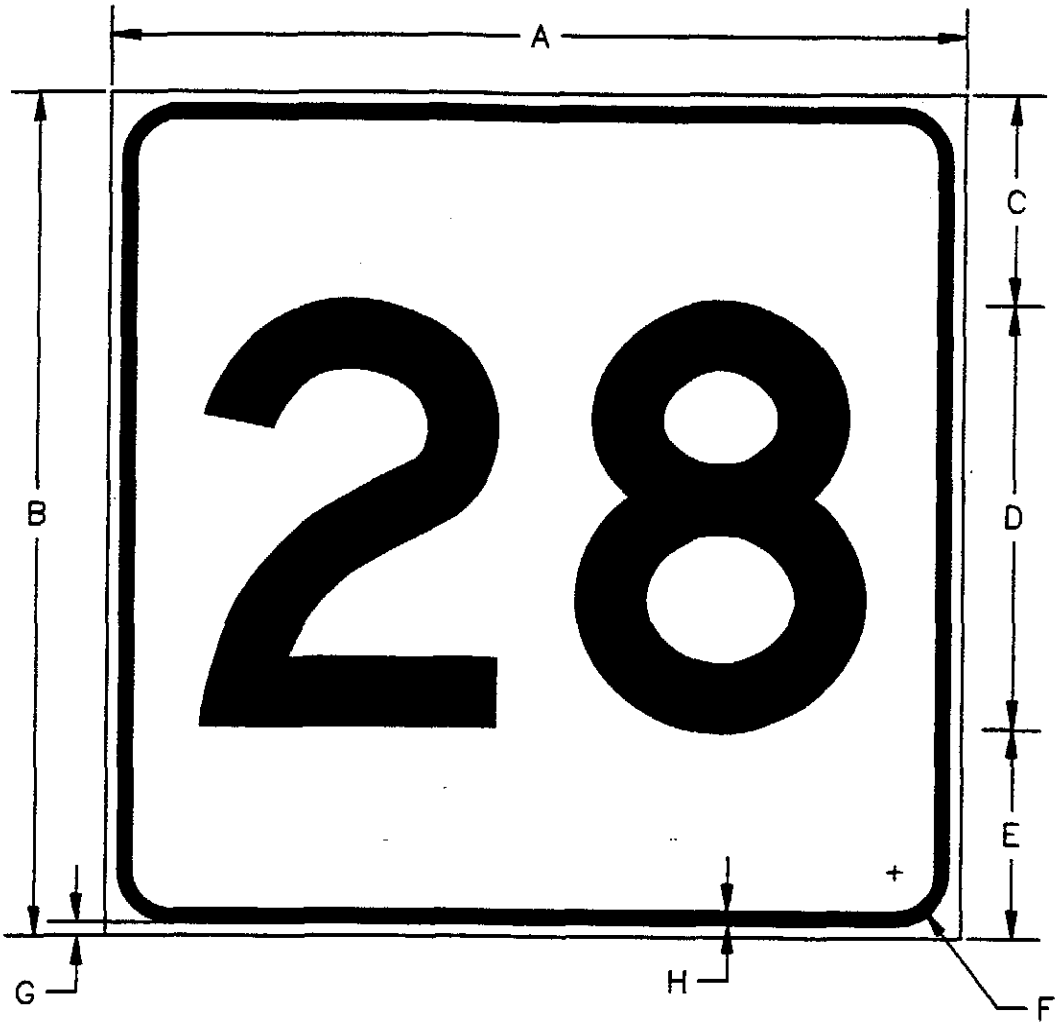
THE DEPARTMENT'S MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (Current edition of the MUTCD with subsequent amendments).

THE A.A.S.H.T.O. PUBLICATION ENTITLED "SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS". (Current edition)

THE DEPARTMENT HAS STANDARDIZED CERTAIN SIGNS AND SUPPORTS, PAVEMENT MARKINGS, AND OTHER DELINEATION. THE DESIGN, PLACEMENT, ETC. OF THESE AS SHOWN HEREIN SHALL BE USED ON ALL CONTRACTS AS NEEDED.

ALL STIFFENERS, BOLTS, NUTS, CLAMPS AND ANGLES (STEEL OR ALUMINUM) MUST BE DESIGNED BY THE CONTRACTOR OR HIS AGENT TO WITHSTAND ALL DESIGN LOADS AND FORCES.

WHEN DESIGNS OTHER THAN THOSE SHOWN AS DEPARTMENT STANDARDS ARE RECOMMENDED, PERMISSION TO USE OTHER DESIGNS MUST BE OBTAINED FROM THE DEPARTMENT BEFORE FABRICATION OR ERECTION.



SERIES OF DIGITS "D"

SIGN SIZES IN MILLIMETERS	NO. OF DIGITS	DIMENSIONS (MILLIMETERS)							
		A	B	C	D	E	F	G	H
600 X 600	1 OR 2	600	600	150	300	150	40	10	15
750 X 600	3	750	600	150	300	150	40	10	15
900 X 600	4	900	600	150	300	150	40	10	15
900 X 900	1 OR 2	900	900	225	450	225	60	15	20
1125 X 900	3	1125	900	225	450	225	60	15	20

MASS HIGHWAY
SIGNS & SUPPORTS

STANDARD STATE ROUTE MARKER

M1-5

DATE OF ISSUE
5/13/95

DRAWING NUMBER
TR.1.1

MASS HIGHWAY
SIGNS & SUPPORTS

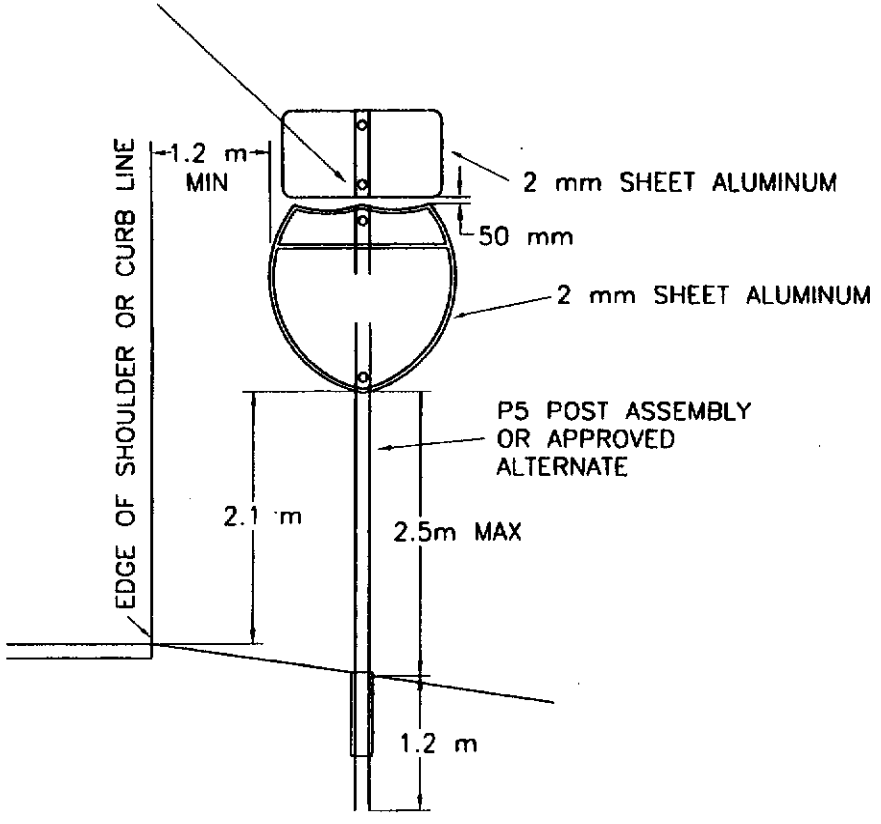
TYPICAL INSTALLATION FOR SMALL SIGNS

(UP TO 2.0 SQUARE METERS)

DATE OF ISSUE 5/13/95

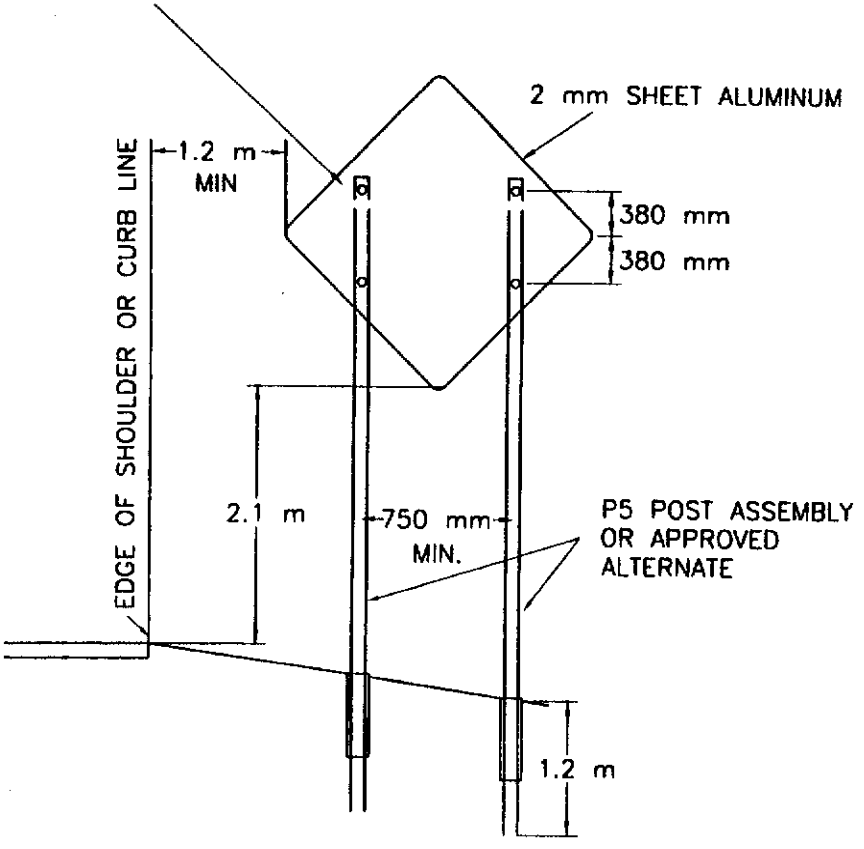
DRAWING NUMBER **TR.1.2**

USE M8 DIA. HOT DIPPED GALVANIZED BUTTON HEAD BOLT WITH A SLOT IN HEAD AND NUT WITH LOCKWASHER, WITH A MINUMUM OF 6 mm OF THREADS BEYOND NUTS ON ALL SIGNS AFTER THEY ARE SECURELY FASTENED.

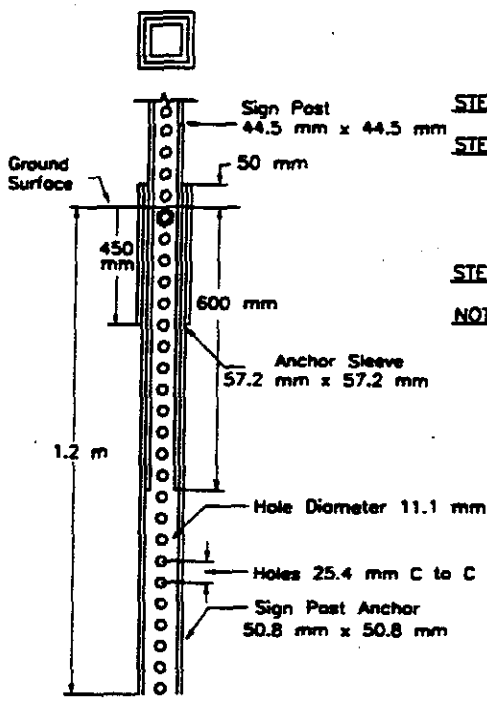


TYPICAL INSTALLATION FOR SIGNS WITH AREA UP TO AND INCLUDING 1.0 SQ. METER SIGNS WITH A WIDTH OF 1.2 METERS AND OVER SHALL REQUIRE TWO POSTS.

USE M10 DIA. HOT DIPPED GALVANIZED BUTTON HEAD WITH A SLOT IN HEAD AND NUT WITH LOCKWASHER, WITH A MINIMUM OF 6 mm OF THREADS BEYOND NUTS ON ALL SIGNS AFTER THEY ARE SECURELY FASTENED.



TYPICAL INSTALLATION FOR SIGNS WITH AREA OVER 1.0 SQ. METER UP TO AND INCLUDING 2.0 SQ. METERS.



P-5 TELESCOPIC POST

GROUND INSTALLATION

METHOD OF INSTALLATION

STEP 1: Drive Sign Post Anchor To Within 75 mm Or 100 mm Of Surface.

STEP 2: Pre-cut Anchor Sleeve So That The Holes Will Match And Still Be Flush With Top Of Sign Post Anchor, Drive Anchor Sleeve Until Holes Match As Noted Above. Then Drive Both The Sign Post Anchor And Anchor Sleeve Until One Hole Is Exposed Above Ground For Bolt Connection.

STEP 3: Insert Sign Post And Bolt In Place.

NOTE:: DRIVING CAPS MUST BE USED TO DRIVE POST. RETAIN 1.2m DEPTH TO REACH THEORETICAL FROST LINE.

GENERAL NOTES

BREAKAWAY SIGN SUPPORTS SHALL BE FABRICATED FROM STEEL AND SHALL CONFORM TO THE BREAKAWAY DESIGN SHOWN ON THIS DRAWING OR ON DRAWING TR.1.2 AND THE MASS HIGHWAY DEPARTMENT STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES.

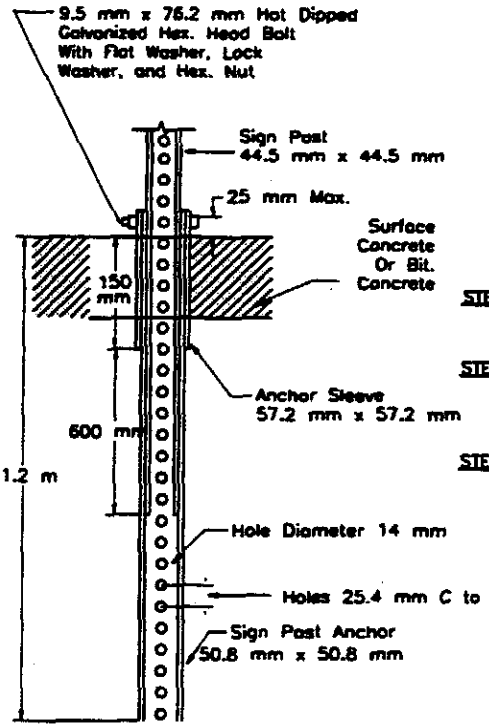
THE STEEL POSTS SHALL CONFORM TO ASTM-A366. THE CROSS SECTION OF THE POST SHALL BE SQUARE TUBE FORMED OF 2.7 mm COLD-ROLLED CARBON STEEL SHEETS WHICH HAVE BEEN ZINC COATED (35.4 g) CONFORMING TO ASTM-A525, CAREFULLY ROLLED TO SIZE AND WELDED DIRECTLY IN THE CORNER BY HIGH FREQUENCY RESISTANCE WELDING OR EQUAL AND EXTERNALLY SCARFED TO AGREE WITH CORNER RADII.

STANDARD OUTSIDE CORNER CORNER RADIUS SHALL BE 4 mm PLUS OR MINUS 0.4 mm.

ALL BOLTS SHALL CONFORM TO ASTM-A307, CLASS A.

ALL BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED AS PER ASTM-A153.

SIGN SIZE	TELESCOPIC POST SIZE
0.5 Sq.m. AND UNDER	1-44.5 mm x 44.5 mm
OVER 0.5 Sq.m. UP TO 1 Sq.m.	1-50.8 mm x 50.8 mm
OVER 1 Sq.m. UP TO 2 Sq.m.	2-50.8 mm x 50.8 mm



P-5 TELESCOPIC POST

METHOD OF INSTALLATION

STEP 1: Sign post anchor can be driven through black top surface without first making a hole. In concrete, however, breaking a hole will be necessary. Drive sign post anchor to within 75 mm or 100 mm of surface.

STEP 2: Pre-cut anchor sleeve so that holes will match and still be flush with top of sign post anchor. Drive anchor sleeve until holes match as noted above, then drive both the sign post anchor and anchor sleeve until one hole is exposed above ground for bolt connection.

STEP 3: Insert sign post and bolt in place.

NOTES:

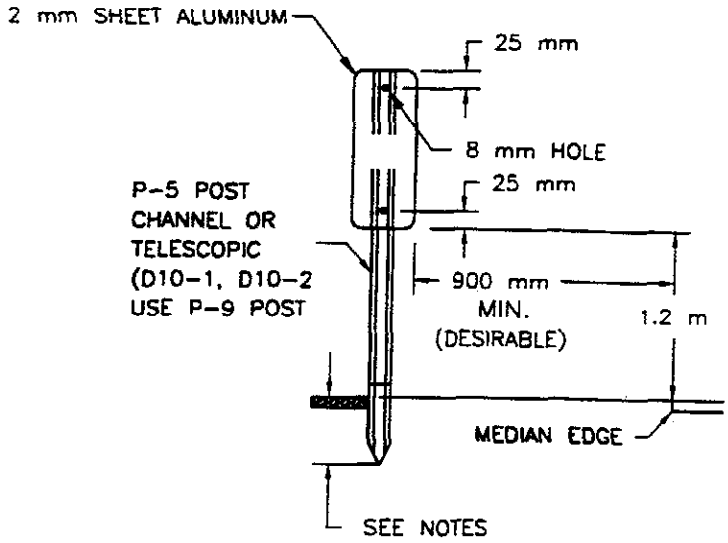
1. DRIVING CAPS MUST BE USED TO DRIVE POSTS.
2. SIGNS WITH A WIDTH OF 1.2 m OR GREATER REQUIRE 2 POSTS.
3. THIS ERECTION PROCEDURE APPLIES TO UNISTRUT SUPPORTS. OTHER P-5 SQUARE TUBE SMALL SIGN SUPPORTS ON THE APPROVED PRODUCT LISTS, SUCH AS ALLIED QUICK PUNCH AND ALLIED POSTMATE, MAY DEVIATE FROM THIS PROCEDURE, IN THOSE CASES, THE MANUFACTURER'S RECOMMENDATIONS SHALL BE FOLLOWED.

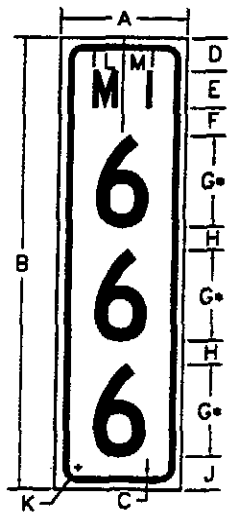
MASS HIGHWAY
SIGNS & SUPPORTS

INSTALLATION FOR TELESCOPIC POST IN CONCRETE OR BITUMINOUS CONCRETE SURFACES

DATE OF ISSUE 5/13/95

DRAWING NUMBER **TR.1.3**





NOTES: IF MILE-MARKER PANEL HEIGHT IS 900 mm THE EMBEDMENT WILL BE 750 mm IF PANEL HEIGHT IS 1.2 m, THE EMBEDMENT WILL BE 900 mm

* OPTICALLY CENTER NUMERAL ABOUT VERTICAL CENTERLINE

BACKGROUND-GREEN REFLECTORIZED
NUMBERS-WHITE REFLECTORIZED
PIN & BOLT HEADS TO BE PAINTED SAME COLOR AS PANEL BACKGROUND
NUMBERS TO BE SERIES "C"

ALL DIMENSIONS SHOWN IN MILLIMETERS

	EXPWY-FWY USE			CONVENTIONAL USE		
	D10-4 (1 DIGIT)	D10-5 (2 DIGIT)	D10-6 (3 DIGIT)	D10-1 *(1 DIGIT)	D10-2 *(2 DIGIT)	D10-3 *(3 DIGIT)
A	300	300	300	250	250	250
B	600	900	1200	450	675	900
C	15	15	15	15	15	15
D	75	75	70	50	50	50
E	100C	100C	100C	100B	100B	100B
F	75	75	75	50	50	50
G	250C	250C	250C	150C	150C	150C
H	---	75	65	---	75	75
J	100	75	75	100	100	100
K	40	40	40	40	40	40
L	117	117	117	92	92	92
M	124	124	124	98	98	98

MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL MILE-MARKER INSTALLATION

DATE OF ISSUE
5/13/95

DRAWING NUMBER
TR.2.1

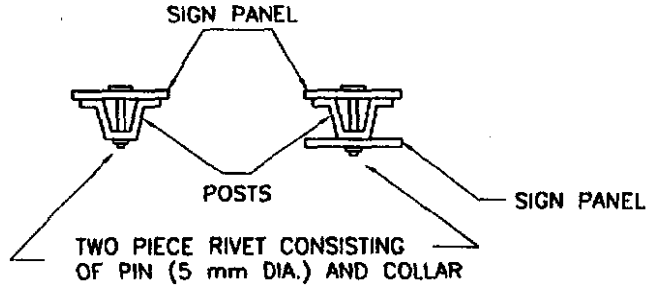
MASS HIGHWAY
SIGNS & SUPPORTS

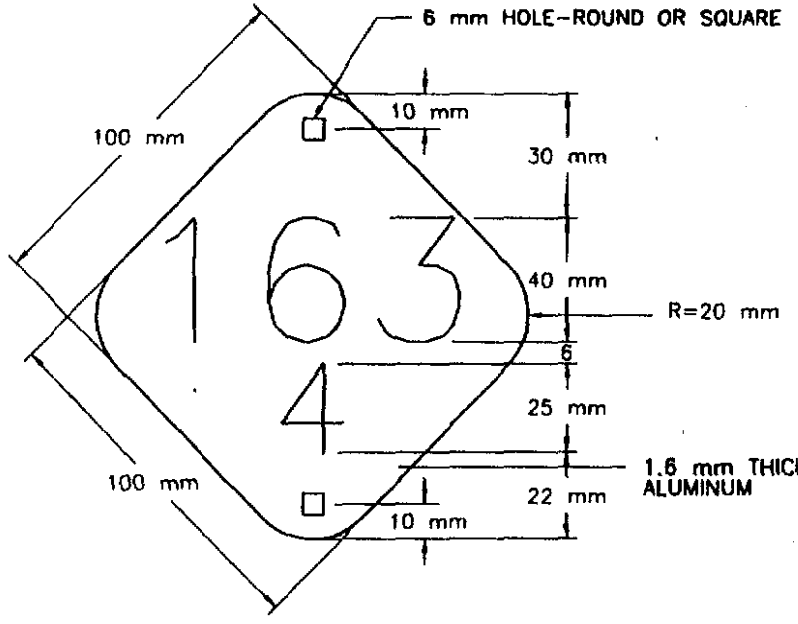
TYPICAL TENTH-OF-MILE MARKER INSTALLATION D10-9

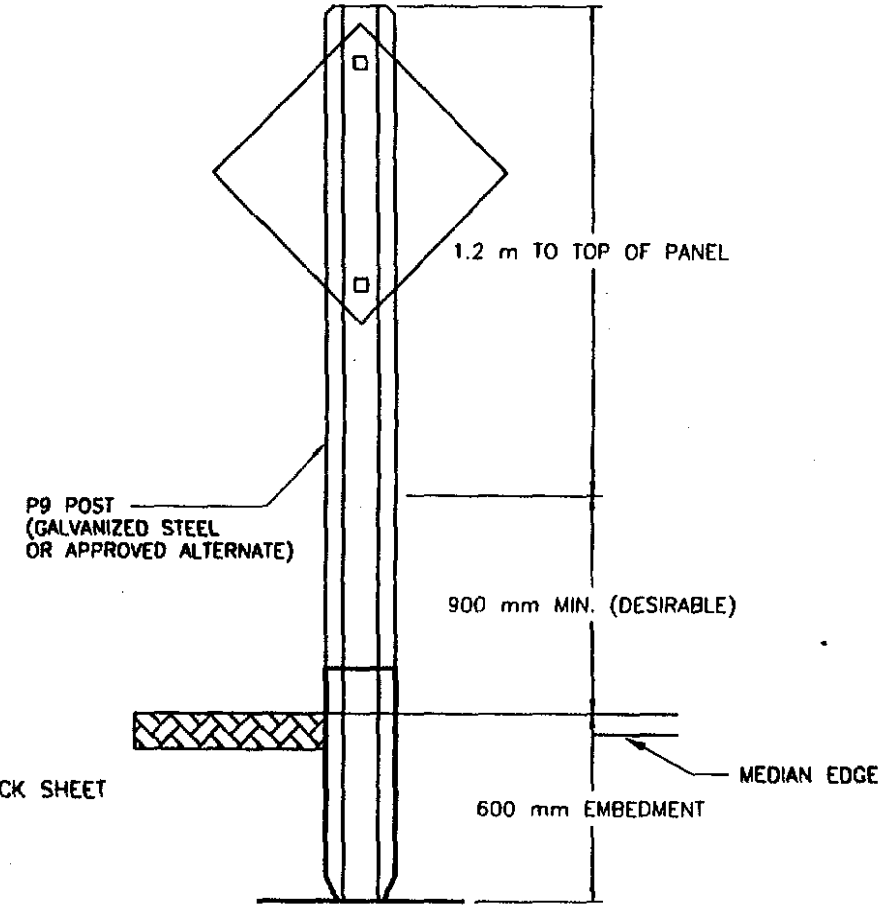
DATE OF ISSUE 5/13/95

DRAWING NUMBER TR.2.2

SINGLE FACED DOUBLE FACED







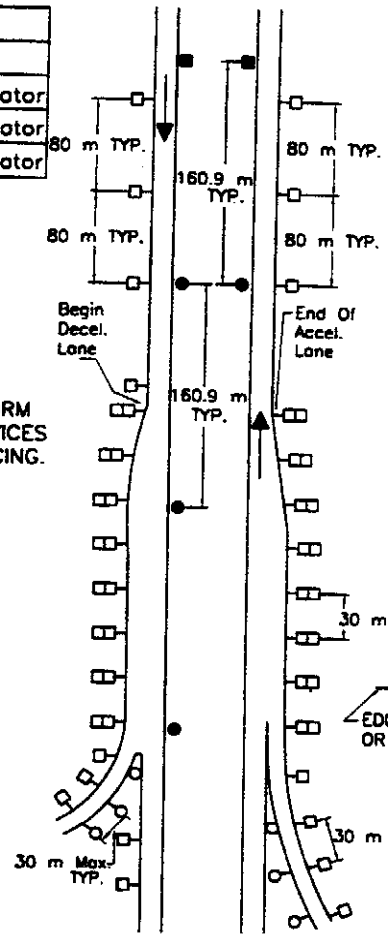
COLOR-BLACK
NUMBERS TO BE SERIES "C"
BACKGROUNDS SHALL BE SILVER-FOR UNDIVIDED HIGHWAYS
YELLOW-FOR DIVIDED HIGHWAYS

NOTES: ALL MILE-MARKERS AND TENTH OF MILE-MARKERS SHALL BE FABRICATED WITH TYPE III OR TYPE IV REFLECTIVE SHEETING (SECTION M9.30.0)

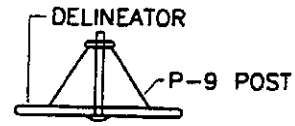
Table	
No.	Color
H1-4	Single White Delineator
H1-7	Double White Delineator
H1-8	Single Amber Delineator

NOTE:
SEE CURRENT EDITION OF MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES FOR DELINEATOR SPACING.

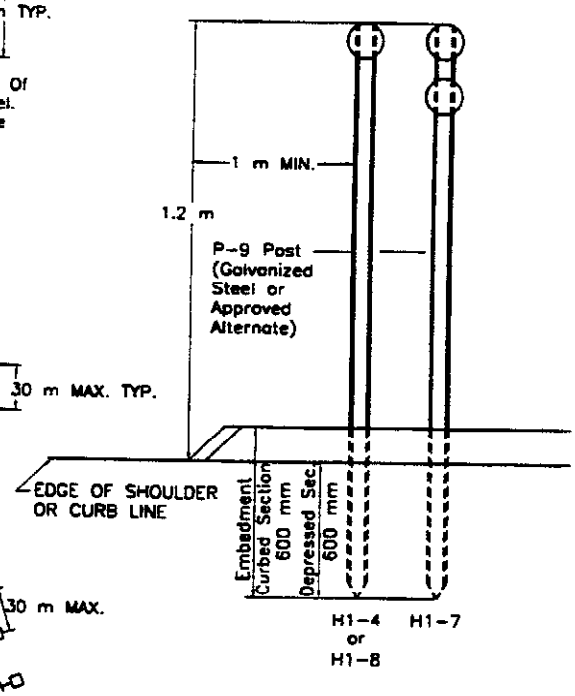
■ =Mile Marker
● =10th of A Mile Marker
=1 White Delineator
=2 White Delineator
=1 Amber Delineator



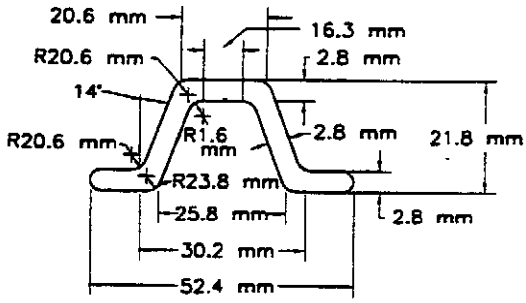
DELINEATOR SPACING



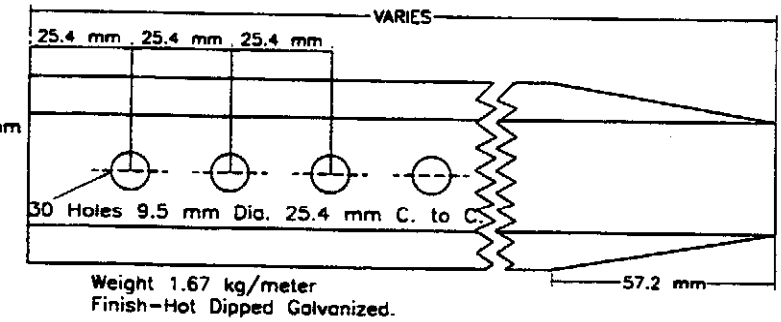
METHOD OF ATTACHING DELINEATOR TO P-9 POST



TYPICAL ELEVATION FOR DELINEATIONS



END VIEW



Weight 1.67 kg/meter
Finish-Hot Dipped Galvanized.

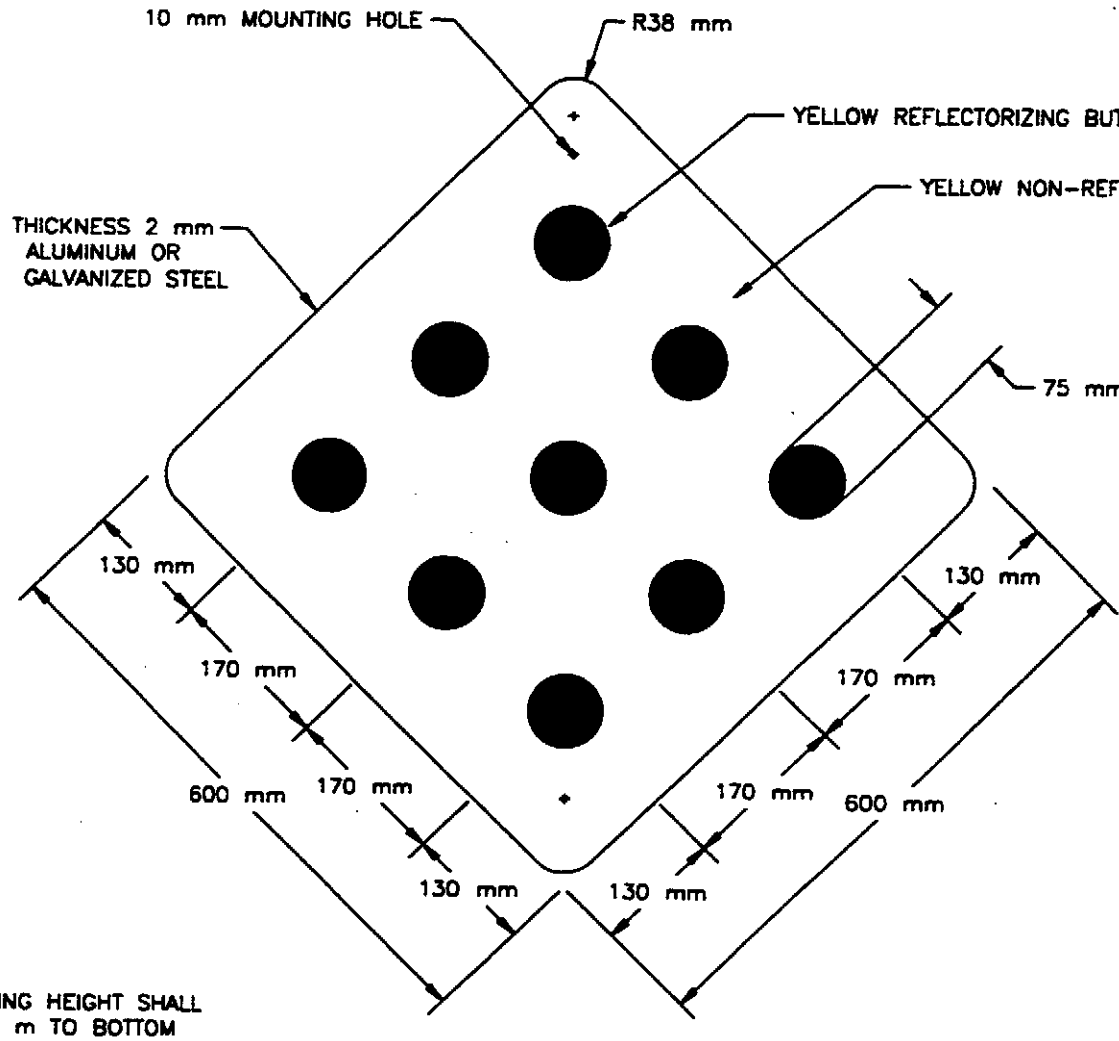
FRONT VIEW

MASS HIGHWAY
SIGNS & SUPPORTS

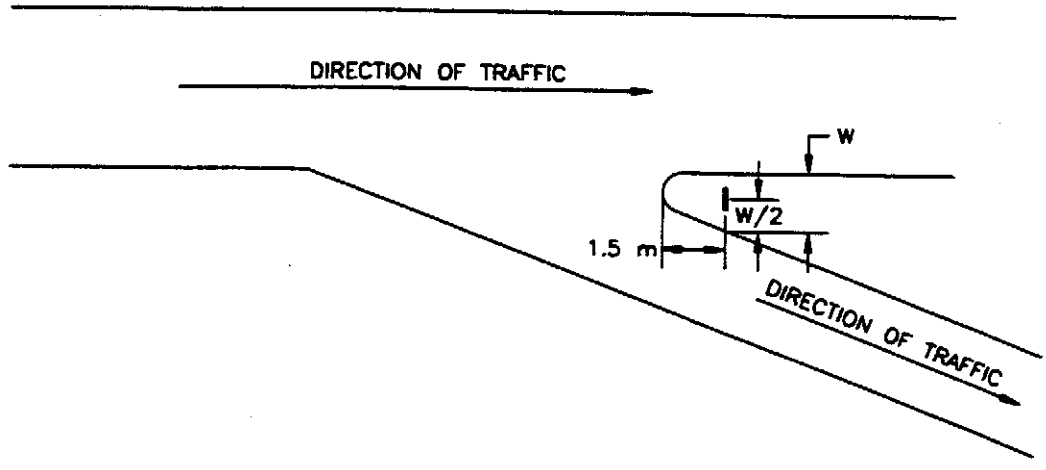
DELINEATOR SPACING & TYPICAL P-9 POSTS

DATE OF ISSUE 5/13/95

DRAWING NUMBER **TR.2.3**



MOUNTING HEIGHT SHALL BE 1.2 m TO BOTTOM OF SIGN

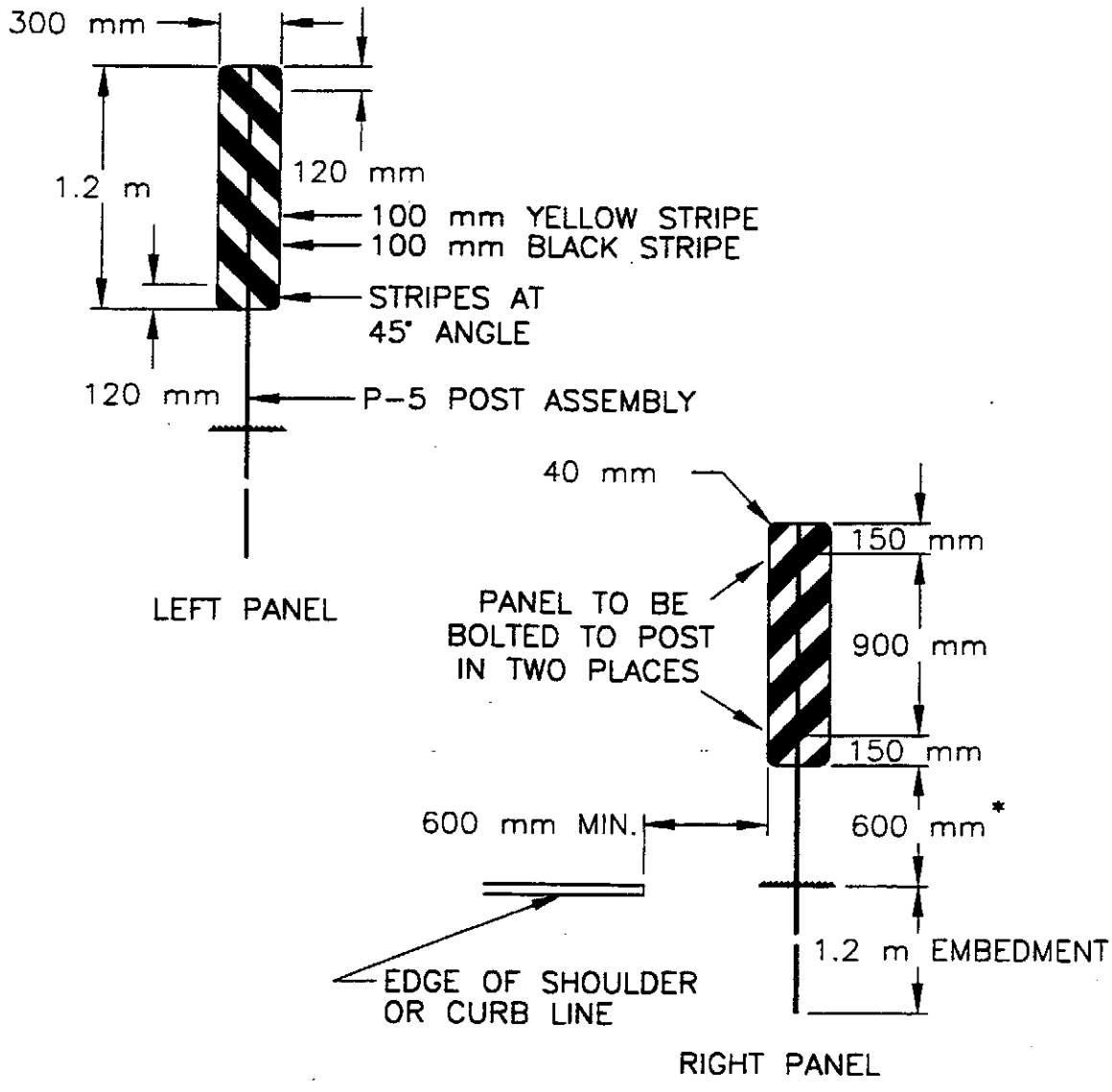


MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL REFLECTORIZED WARNING SIGN

DATE OF ISSUE
5/13/95

DRAWING NUMBER
TR.2.4

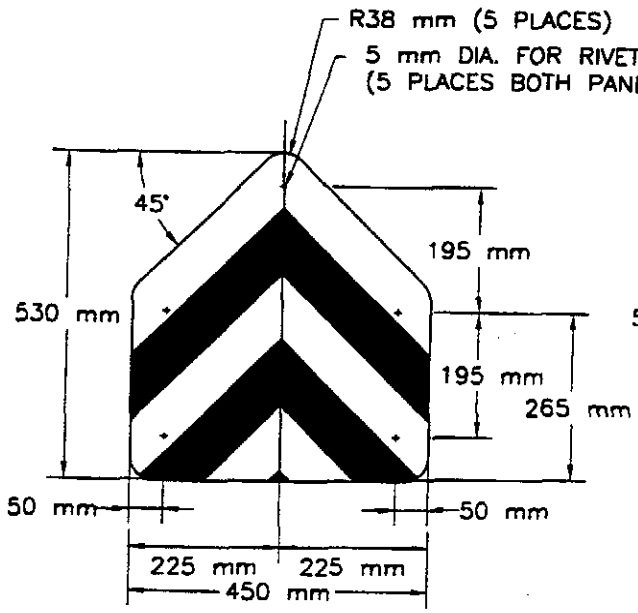


MATERIAL: 2 mm THICK SHEET ALUMINUM

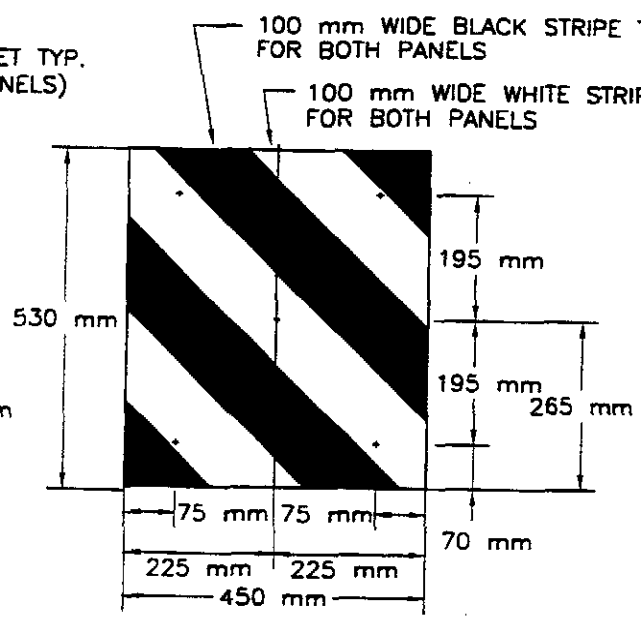
COLORS:
ALTERNATE YELLOW AND BLACK STRIPES
YELLOW STRIPES TO BE REFLECTORIZED
ALTERNATE WHITE AND ORANGE STRIPES FOR CONSTRUCTION AND MAINTENANCE OPERATIONS, BOTH REFLECTORIZED

* OR GREATER TO CLEAR GUARD RAIL BY MAXIMUM OF 150 mm

MASS HIGHWAY SIGNS & SUPPORTS	TYPICAL ABUTMENT WARNING PANEL (H1-3 LEFT & RIGHT)	DATE OF ISSUE 5/13/95
		DRAWING NUMBER TR.2.5

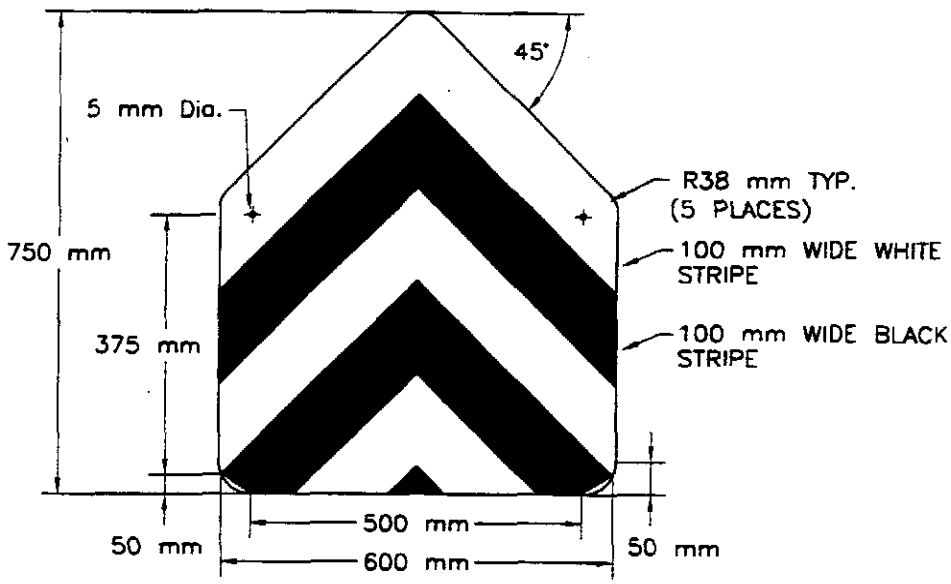


H1-10B



H1-10C
L OR R

ATTENUATOR PANEL
FOR G.R.E.A.T. SYSTEM BARRIER NOSE COVER



H1-10A

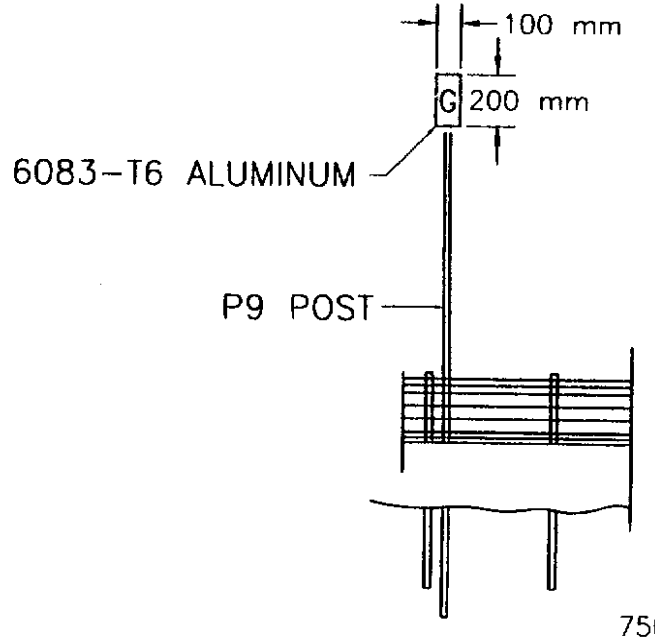
NOTE: THE STRIPING IS TO BE MOUNTED ON 0.8 mm ALUMINUM PANEL USING ALTERNATING BLACK AND WHITE STRIPES SLOPING DOWN AT AN ANGLE OF 45°. THE ALUMINUM PANEL SHALL BE IN ACCORDANCE WITH ASTM B209 ALLOY 6061-T6. THE SILVER REFLECTIVE SHEETING SHALL BE IN ACCORDANCE WITH MHD SPECIFICATION M9.30.0 TYPE III OR TYPE IV REFLECTIVE SHEETING. PAINT FOR BLACK STRIPES SHALL BE IN ACCORDANCE WITH THE SHEETING MANUFACTURER'S SPECIFICATION FOR BLACK SILK SCREEN INK FOR H1-10A, H1-10B, & H1-10C.

MASS HIGHWAY SIGNS & SUPPORTS	ATTENUATOR PANELS	DATE OF ISSUE 5/13/95
		DRAWING NUMBER TR.2.6

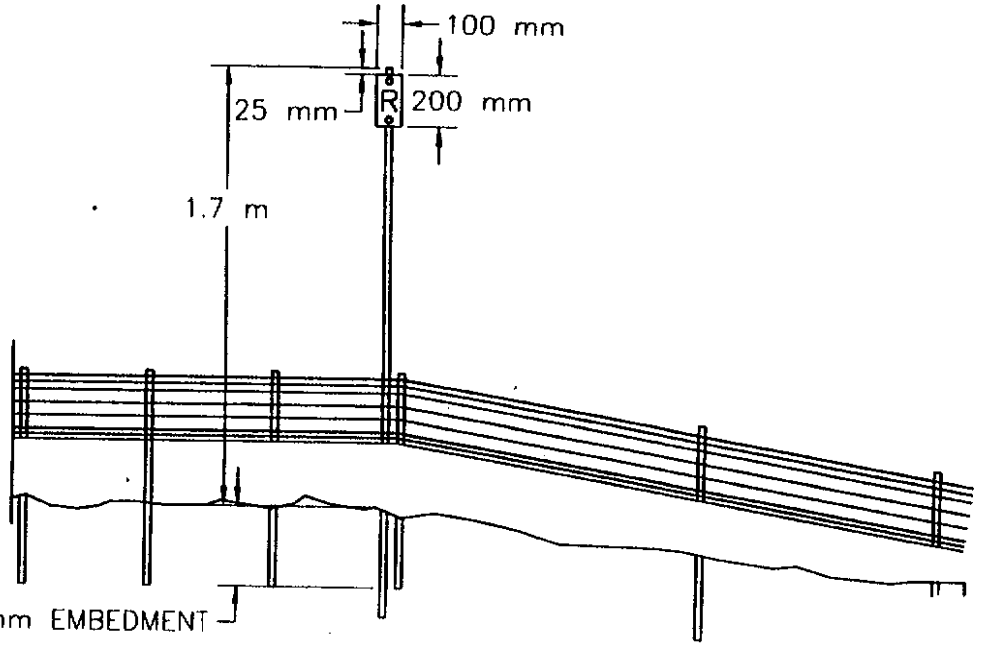
MASS HIGHWAY
SIGNS & SUPPORTS

DELINEATION FOR GUARD RAIL TERMINI

TRAILING END



APPROACH END

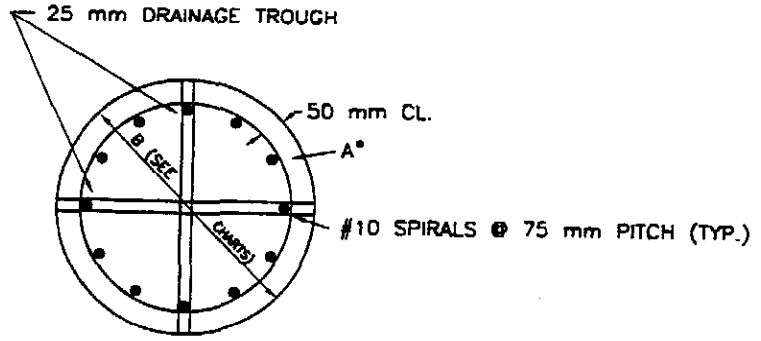


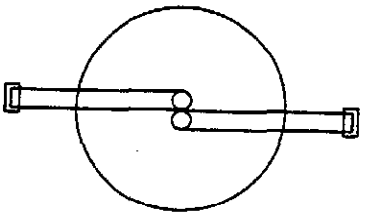
NOTES:

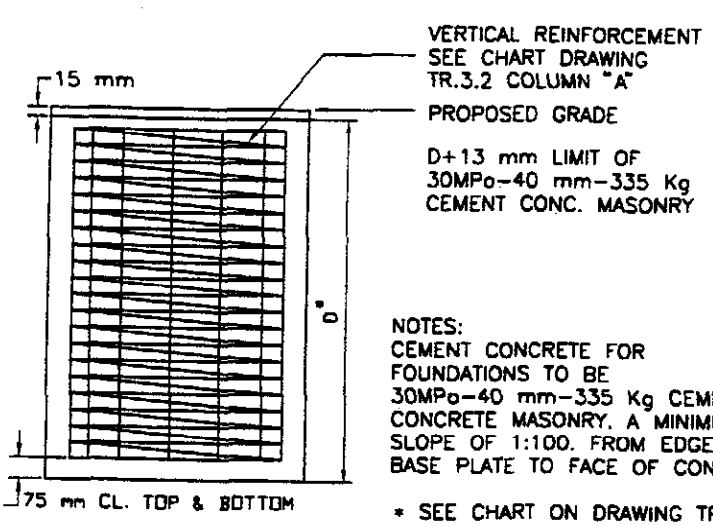
1. THE FIRST FULL HEIGHT POST ENCOUNTERED IN THE DIRECTION OF TRAVEL SHALL BE MARKED BY A "RED" DELINEATOR AND THE LAST FULL HEIGHT END POST IN THE SECTION SHALL BE MARKED BY A "GREEN" DELINEATOR.
2. DELINEATORS SHALL BE FABRICATED FROM TYPE III OR TYPE IV REFLECTIVE SHEETING (M9.30.0)
3. P9 POSTS SHALL BE ERECTED WITHIN 150 mm PERPENDICULAR TO THE WEB OF GUARDRAIL POST.

DATE OF ISSUE 5/13/95

DRAWING NUMBER **TR.2.7**



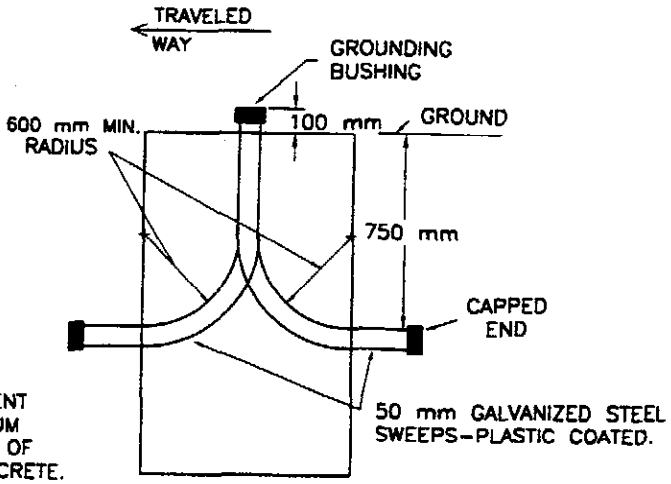




NOTES:
CEMENT CONCRETE FOR FOUNDATIONS TO BE 30MPa-40 mm-335 Kg CEMENT CONCRETE MASONRY. A MINIMUM SLOPE OF 1:100. FROM EDGE OF BASE PLATE TO FACE OF CONCRETE.

* SEE CHART ON DRAWING TR.3.2

TYPICAL SIGN SUPPORT FOUNDATION



TYPICAL DETAIL OF ELETRICAL CONDUIT SWEEPS TO BE PLACED IN STANDARD OVERHEAD SIGN FOUNDATIONS.

GENERAL NOTES

THE CONTRACTOR MAY SELECT ANY STRUCTURAL SIGN SUPPORT MEETING THE DESIGN CRITERIA OF THE CURRENT EDITION OF THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS "SPECIFICATIONS FOR DESIGN AND CONSTRUCTION OF STRUCTURAL SUPPORTS FOR HIGHWAY SIGNS" AND SECTION 828 OF THE STANDARD SPECIFICATIONS.

REINFORCED CONCRETE FOUNDATIONS FOR SIGN SUPPORTS SELECTED SHALL CONFORM TO THE APPLICABLE TABULATION REQUIREMENTS BASED ON THE SECTION MODULUS AT THE BOTTOM OF THE SIGN SUPPORT POST.

THE FOUNDATIONS LISTED ARE INTENDED FOR A SINGLE POLE IN THE DIRECTION NORMAL TO THE SIGN, BUT THE NUMBER OF POLES PARALLEL TO THE SIGN SHALL CONFORM WITH THE CONSTRUCTION DRAWINGS. IF IT IS DESIRED TO USE OTHER THAN SINGLE POLE SUPPORTS. THE CONTRACTOR SHALL DESIGN THE FOUNDATIONS FOR SAME AND SUBMIT DESIGN CALCULATIONS WITH SKETCHES.

ACCEPTANCE OF THE DESIGNS OF THE SIGN SUPPORTS AND SIGN SUPPORT FOUNDATIONS WILL BE CONTINGENT ON THE DEPARTMENT'S REVIEW AND APPROVAL OF DESIGN CALCULATIONS AND SHOP DRAWINGS SUBMITTED BY THE CONTRACTOR. THE INFORMATION GIVEN ABOVE IS TO BE USED IN CONJUNCTION WITH THE TABLE ON DRAWING TR.3.2.

THESE TABLES ARE NOT TO BE USED FOR THE DESIGN OF CANTILEVER SIGN FOUNDATIONS.

SEE CONSTRUCTION STANDARDS DRAWING 401.2.0 FOR INSTALLATION FOR TYPE SS HIGHWAY GUARD RAIL FOR PROTECTION OF OVERHEAD SIGN POSTS.

MASS HIGHWAY SIGNS & SUPPORTS	HIGHWAY SIGN SUPPORT AND SIGN SUPPORT FOUNDATIONS (NON-BREAKAWAY SUPPORTS)	DATE OF ISSUE 5/13/95 DRAWING NUMBER TR.3.1

SECTION MODULUS AT BOTTOM OF SUPPORT ($\times 10^3$ mm^3)	B (mm)	D (m)	A
4.55 mm WALL THICKNESS			
to 347.4	760	2.0	12–No.15
347.41 to 417.9	915	2.0	8–No.20
417.91 to 490.0	915	2.1	14–No.15
490.01 to 550.6	1065	2.1	12–No.15
550.61 to 655.5	1065	2.3	10–No.20
655.51 to 729.2	1065	2.4	16–No.15
729.21 to 801.3	1065	2.6	8–No.25
801.31 to 875.1	1220	2.4	10–No.20
6.35 mm WALL THICKNESS			
to 490.1	760	2.4	12–No.20
490.11 to 539.1	915	2.3	8–No.25
539.11 to 604.7	915	2.4	12–No.20
604.71 to 670.2	915	2.6	10–No.25
670.21 to 747.2	1065	2.4	10–No.25
747.21 to 824.3	1065	2.6	10–No.25
824.31 to 900.0	1065	2.7	22–No.15
900.01 to 1032.4	1065	2.9	20–No.15
1032.41 to 1117.6	1065	3.0	22–No.15
1117.61 to 1166.8	1220	2.9	10–No.25
1166.81 to 1240.5	1220	3.0	22–No.15
1240.51 to 1307.7	1220	3.0	22–No.15
1307.71 to 1370.0	1220	3.2	16–No.20
1370.01 to 1506.0	1220	3.4	12–No.25
1506.01 to 1648.5	1220	3.5	20–No.20
1648.51 to 1796.0	1220	3.7	12–No.25
7.94 mm WALL THICKNESS			
to 476.9	760	2.3	12–No.20
476.91 to 565.4	760	2.4	10–No.25
565.41 to 653.8	915	2.6	10–No.25
653.81 to 740.7	915	2.6	20–No.15
740.71 to 827.5	915	2.9	24–No.15
827.51 to 898.0	1065	2.7	22–No.15
898.01 to 968.5	1065	2.9	12–No.25
968.51 to 1038.9	1065	3.0	18–No.20
1038.91 to 1112.7	1065	3.0	14–No.25
1112.71 to 1237.2	1065	3.0	30–No.15
1237.21 to 1381.4	1220	3.2	12–No.25
1381.41 to 1535.5	1220	3.4	26–No.15
1535.51 to 1696.1	1220	3.7	30–No.15
1696.11 to 1866.5	1220	3.8	10–No.30
1866.51 to 2043.5	1220	4.0	14–No.25
2043.51 to 2228.6	1220	4.3	20–No.25
9.11 mm WALL THICKNESS			
to 508.0	760	2.4	10–No.25
508.01 to 609.6	760	2.6	22–No.15
609.61 to 719.4	915	2.6	10–No.25
719.41 to 839.0	915	2.9	24–No.15
839.01 to 968.5	915	3.0	28–No.15
968.51 to 1107.8	1065	3.0	26–No.15
1107.81 to 1255.2	1065	3.2	30–No.15
1255.21 to 1412.6	1065	3.5	14–No.25
1412.61 to 1578.1	1220	3.5	14–No.25
1578.11 to 1753.4	1220	3.7	30–No.15
1753.41 to 1938.6	1220	3.8	24–No.20
1938.61 to 2131.9	1220	4.1	26–No.20

SECTION MODULUS AT BOTTOM OF SUPPORT ($\times 10^3$ mm^3)	B (mm)	D (m)	A
10.90 mm WALL THICKNESS			
to 594.8	760	2.6	8–No.25
594.81 to 714.5	915	2.6	14–No.20
714.51 to 845.6	915	2.9	10–No.25
845.61 to 988.1	915	3.2	30–No.15
988.11 to 1142.2	915	3.4	24–No.20
1142.21 to 1306.0	1065	3.4	10–No.30
1306.01 to 1481.4	1065	3.7	38–No.15
1481.41 to 1668.2	1065	3.8	22–No.25
1668.21 to 1864.8	1220	3.8	10–No.30
1864.81 to 2073.0	1220	4.1	36–No.15
2073.01 to 2294.2	1220	4.3	16–No.25
2294.21 to 2523.6	1220	4.6	14–No.30
12.70 mm WALL THICKNESS			
to 678.4	915	2.6	20–No.15
678.41 to 817.7	915	2.7	12–No.20
817.71 to 968.5	915	3.0	12–No.25
968.51 to 1132.3	915	3.4	12–No.30
1132.31 to 1309.3	915	3.7	14–No.30
1309.31 to 1499.4	915	4.0	16–No.25
1499.41 to 1702.6	1065	4.0	14–No.25
1702.61 to 1917.3	1065	4.3	16–No.25
1917.31 to 2146.7	1065	4.4	14–No.30
2146.71 to 2387.6	1220	4.4	22–No.25
2387.61 to 2641.6	1220	4.7	34–No.20
2641.61 to 2908.7	1220	5.0	28–No.25
2908.71 to 3188.9	1220	5.3	18–No.30
3188.91 to 3482.2	1370	5.2	16–No.35
14.29 mm WALL THICKNESS			
to 750.5	915	2.7	22–No.15
750.51 to 904.6	915	3.0	14–No.25
904.61 to 1073.3	915	3.2	16–No.25
1073.31 to 1256.9	1065	3.4	12–No.25
1256.91 to 1455.2	1065	3.5	36–No.15
1455.21 to 1668.2	1065	3.8	14–No.25
1668.21 to 1894.3	1065	4.1	20–No.25
1894.31 to 2135.2	1220	4.1	12–No.30
2135.21 to 2390.9	1220	4.4	22–No.25
2390.91 to 2669.4	1220	4.7	19–No.25
2669.41 to 2946.4	1220	5.0	38–No.20
2946.41 to 3244.6	1220	5.3	12–No.35
3244.61 to 3559.3	1370	5.2	16–No.35
3559.31 to 3887.0	1370	5.5	30–No.25
15.88 mm WALL THICKNESS			
to 819.4	915	2.9	24–No.15
819.41 to 989.8	915	3.0	10–No.25
989.81 to 1176.6	915	3.4	12–No.25
1176.61 to 1378.1	1065	3.5	20–No.20
1378.11 to 1596.1	1065	3.8	10–No.30
1596.11 to 1830.4	1065	4.1	12–No.30
1830.41 to 2081.1	1220	4.1	36–No.15
2081.11 to 2348.3	1220	4.4	22–No.25
2348.31 to 2630.1	1220	4.7	24–No.25
2630.11 to 2930.0	1220	5.0	38–No.20
2930.01 to 3244.6	1220	5.3	12–No.35
3244.61 to 3575.6	1370	5.3	22–No.25
3575.61 to 3919.8	1370	5.6	24–No.25
3919.81 to 4285.2	1525	5.5	42–No.20

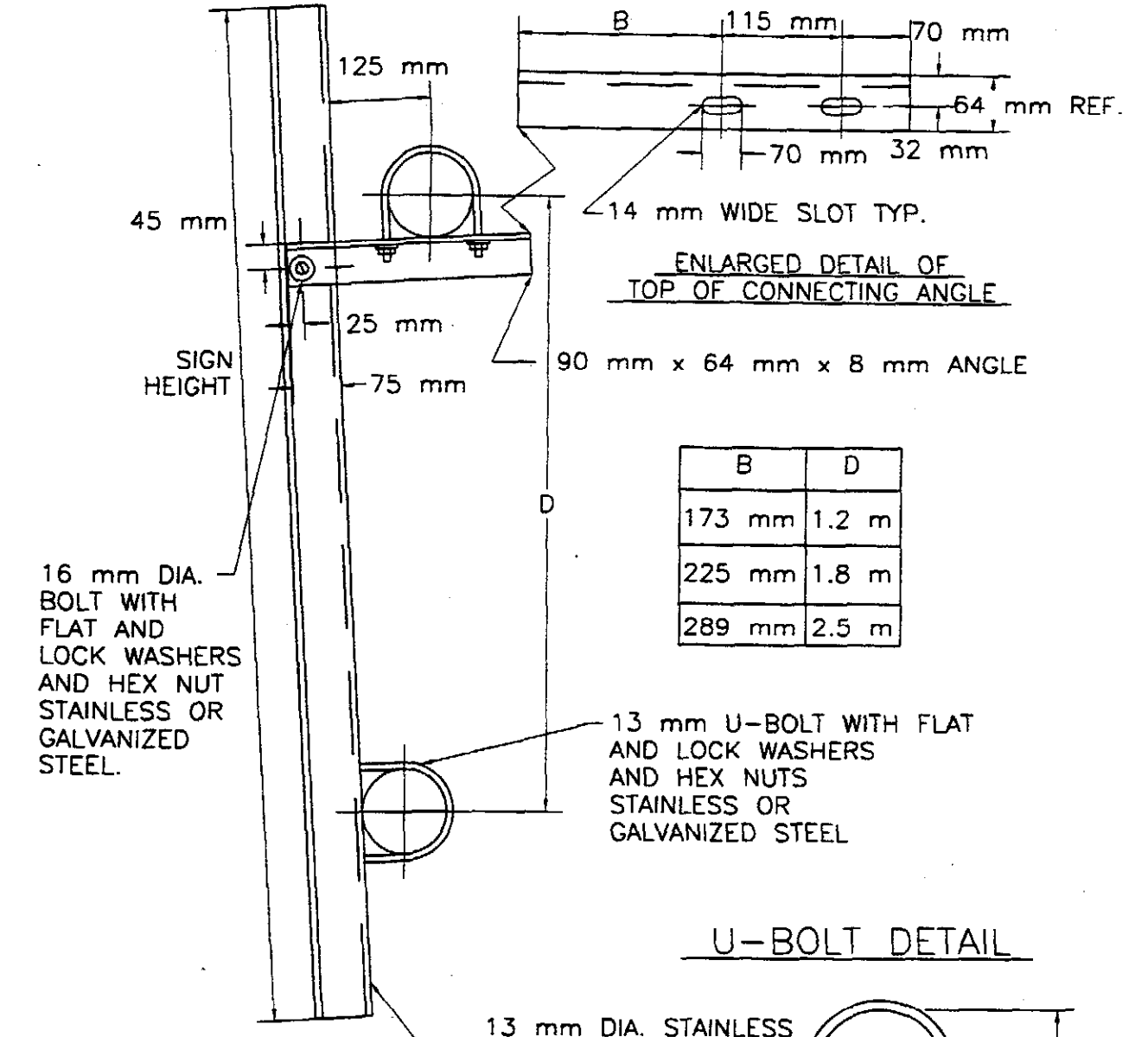
NOTES:
1. THE SECTION MODULI LISTED ABOVE ARE TO BE USED FOR STEEL SIGN SUPPORT POLES WITH AN ALLOWABLE WORKING STRESS OF 343 MPa. IF POLES OF AN ALTERNATE MATERIAL ARE USED, THE SECTION MODULI OF THE POLES SHALL BE MULTIPLIED BY THE RATIO: [(ALLOWABLE WORKING STRESS)/343].
2. MINIMUM DISTANCE FROM CENTER OF THE ANCHOR BOLTS TO THE FACE OF THE CONCRETE SHALL BE 125 mm.
3. THE ACTUAL DEPTH OF THE FOUNDATION WILL BE THE "D" DIMENSION ABOVE PLUS THE 15 mm REVEAL.
4. THE WALL THICKNESSES LISTED ABOVE REFER TO THE STEEL SIGN SUPPORT POLES.

MASS HIGHWAY
SIGNS & SUPPORTS

FOUNDATION DATA TABLE

DATE OF ISSUE
5/13/95

DRAWING NUMBER
TR.3.2



B	D
173 mm	1.2 m
225 mm	1.8 m
289 mm	2.5 m

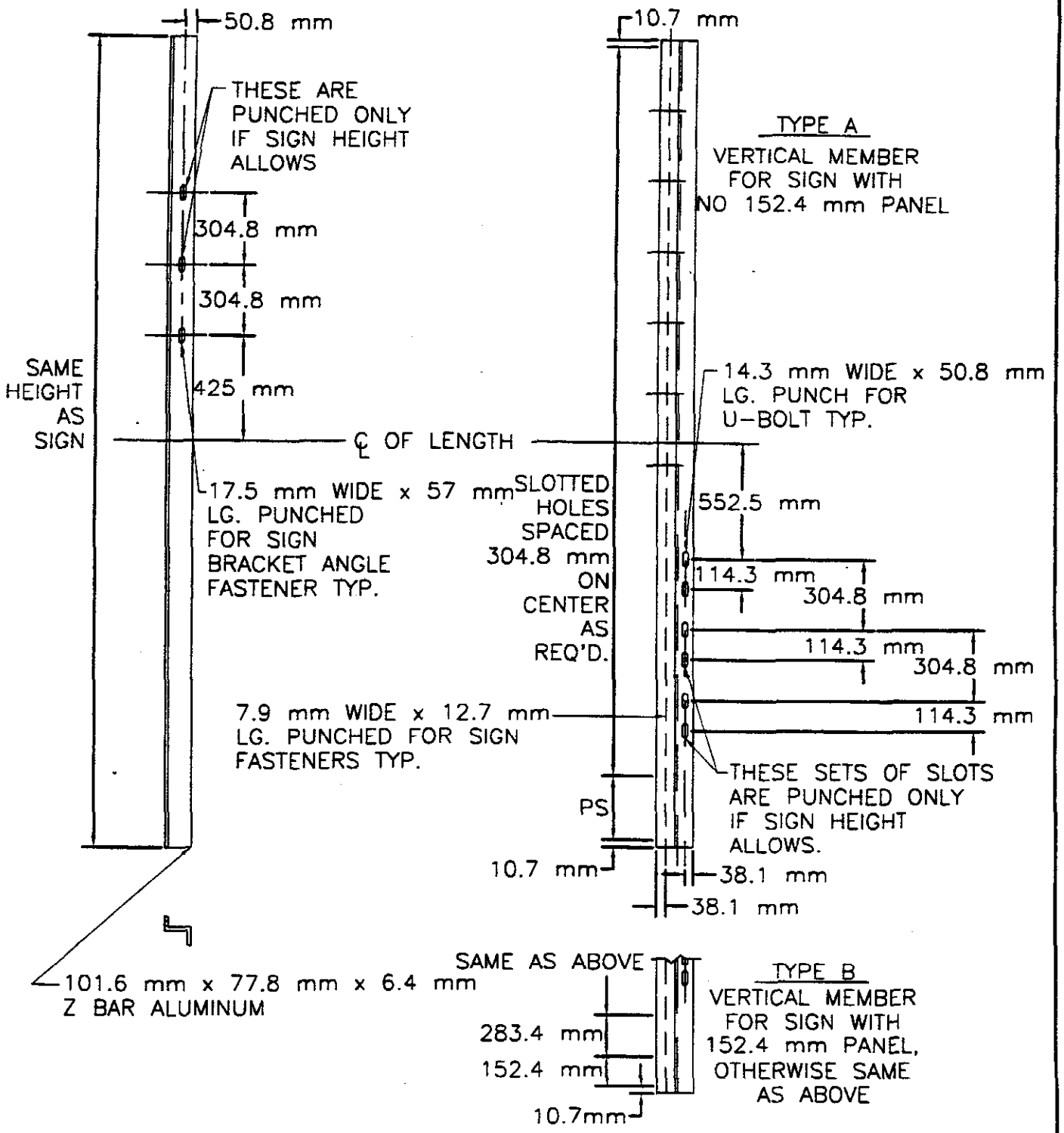
U-BOLT DETAIL

MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL PANEL ATTACHMENT TO OVERHEAD SUPPORT

DATE OF ISSUE
5/13/95

DRAWING NUMBER
TR.3.3



MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL PANEL ATTACHMENT TO OVERHEAD SUPPORT
(CONTINUED)

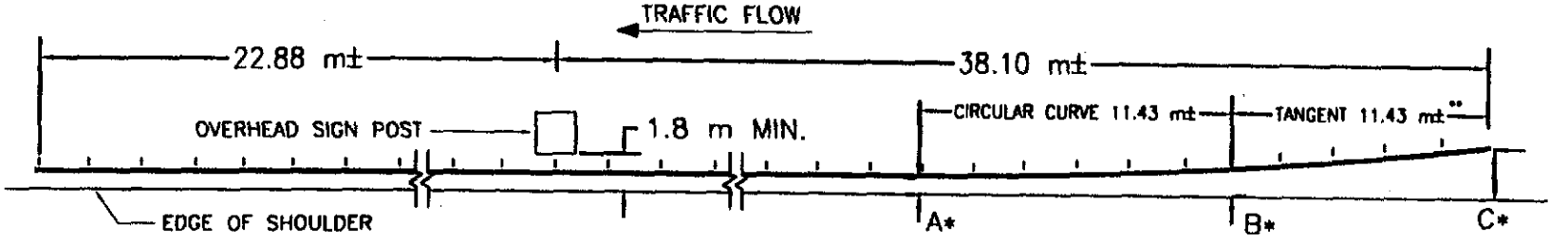
DATE OF ISSUE 5/13/95

DRAWING NUMBER **TR.3.4**

MASS HIGHWAY

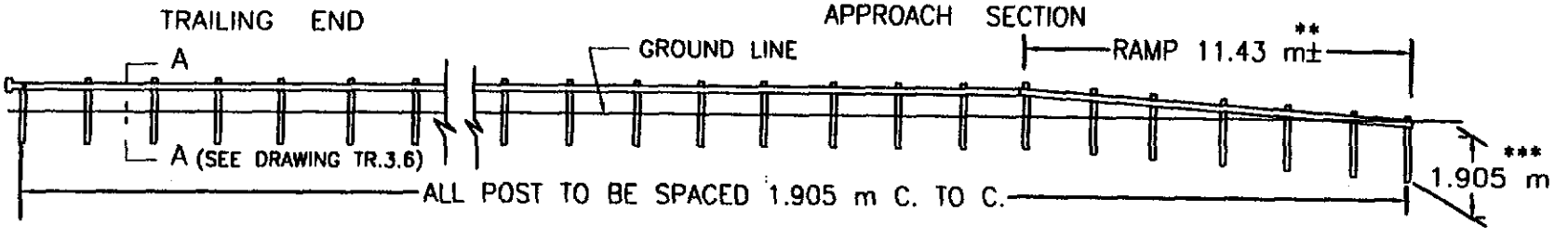
SIGNS & SUPPORTS

INSTALLATION OF TYPE SS HIGHWAY GUARD RAIL FOR PROTECTION OF OVERHEAD SIGN POSTS



PLAN VIEW

*SEE TABLE ON DRAWING TR.3.6 FOR DIMENSIONS
**–15.24 m FOR THRIE BEAM



ELEVATION VIEW

*** STANDARD LENGTH POSTS SHALL BE USED IN RAMPED SECTIONS

NOTES:

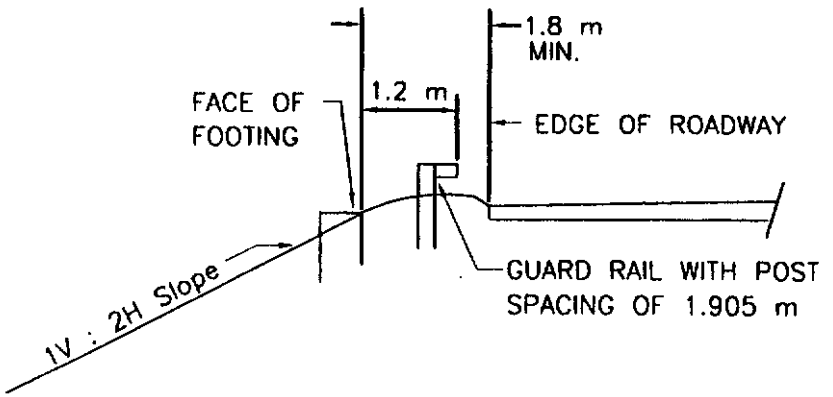
1- LENGTHS OF HIGHWAY GUARD SHOWN ARE MEASUREMENTS ALONG FACE OF RAILING
2- FOR DESCRIPTIONS, MATERIAL AND CONSTRUCTION METHODS, SEE THE STANDARD SPECIFICATIONS AND CONSTRUCTION DRAWINGS 401.1.0 AND 401.5.0 – 401.10.0
3- FOR BACK UP PLATE DETAILS SEE CONSTRUCTION DRAWINGS 401.6.0 AND 401.8.0
4- DETAILS SHOWN HEREIN ALSO APPLY TO THRIE BEAM GUARD RAIL, EXCEPT AS OTHERWISE NOTED.
5- WHEN PLACED IN MEDIAN, CHANGE TO THRIE BEAM & HEIGHT OF 775 mm + 25 mm
6- POST TYPES SHALL NOT BE INTERCHANGED IN ANY CONTINUOUS RUN OF GUARD RAIL. BRACKETS SHALL BE SIMILAR TO POST.

DATE OF ISSUE 5/13/95

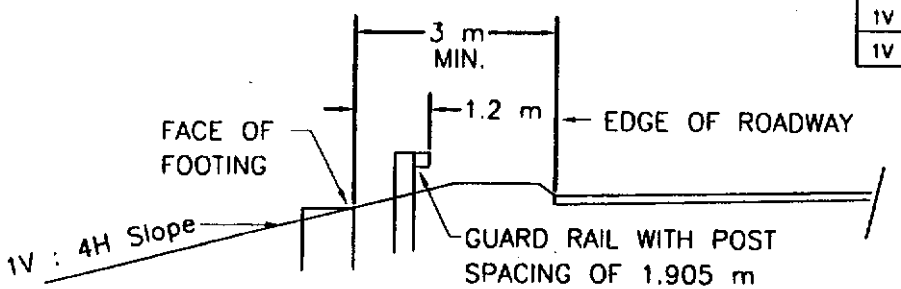
DRAWING NUMBER **TR.3.5**

MASS HIGHWAY
SIGNS & SUPPORTS

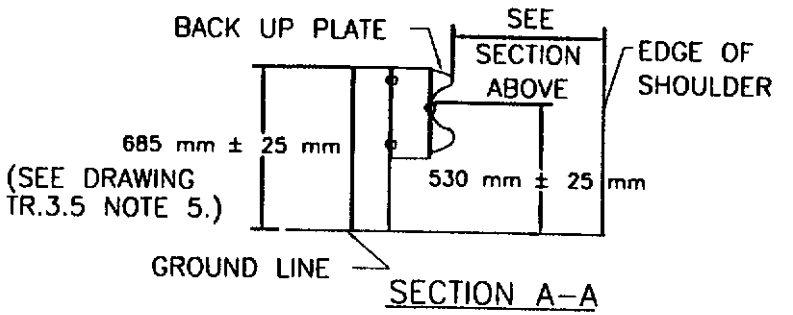
OVERHEAD STRUCTURE GUARD RAIL INSTALLATION



FULL SPAN – 1V : 2H SLOPE & CANTILEVER STRUCTURES



FULL SPAN – 1V : 4H SLOPE



SECTION A–A

TABLE FOR OVERHEAD SIGN PROTECTION (401.3.0)

	A	B	C	
			W SECTION	THRIE BEAM
1V : 2H SLOPE	460 mm±	1.0 m±	2.0 m±	2.3 m±
1V : 4H SLOPE	1.8 m±	2.4 m±	3.4 m±	3.7 m±
1V : 6H SLOPE	4.9 m±	5.4 m±	6.4 m±	6.7 m±

TABLE OF OFFSETS FOR GUARDRAIL FLARED ENDS
* THESE TABLES APPLY TO DRAWING TR.3.5

TABLE FOR TYPICAL INSTALLATION

	A	B	C	
			W SECTION	THRIE BEAM
VERTICAL CURB	230 mm±	760 mm±	1.8 m±	2.1 m±
SLOPED EDGING	460 mm±	1.0 m±	2.0 m±	2.3 m±
TYPE "A" BERM	610 mm±	1.1 m±	2.1 m±	2.5 m±

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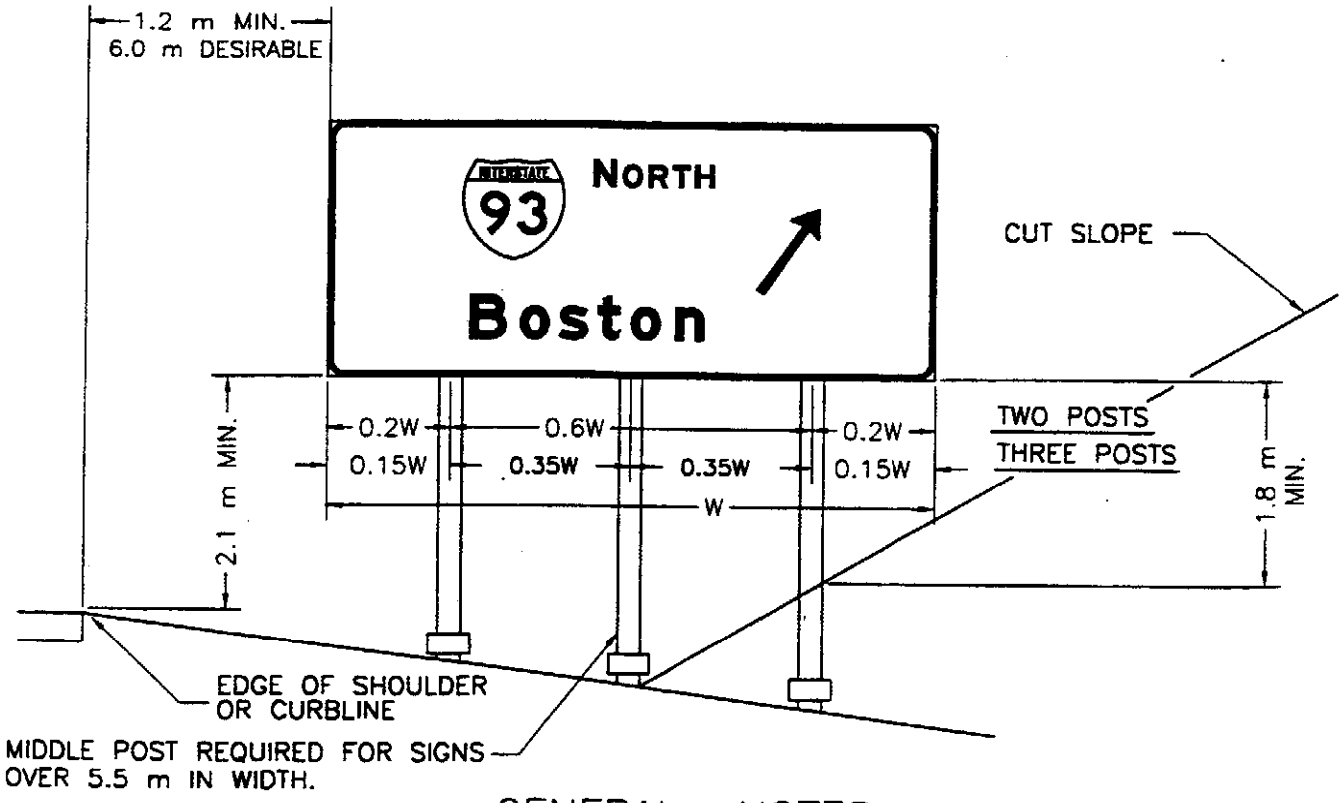


GENERAL NOTES

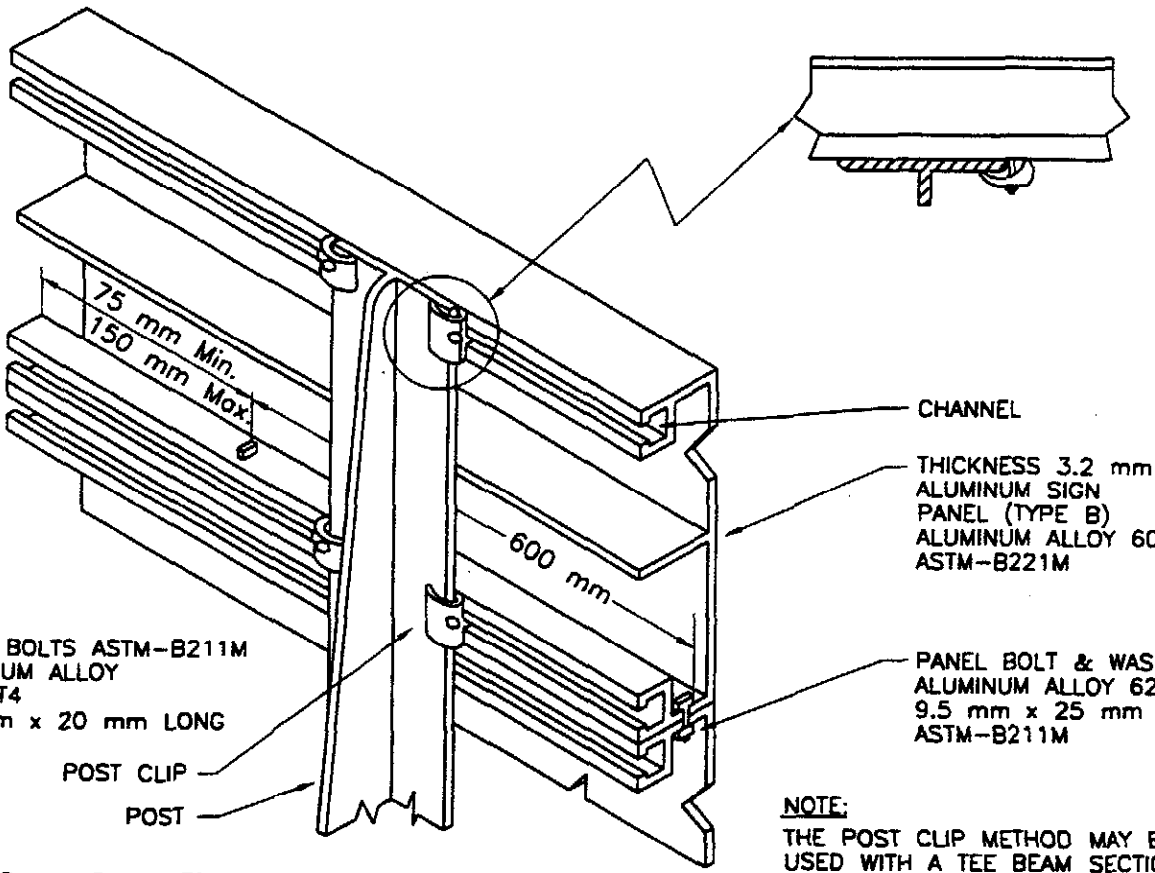
BREAKAWAY SIGN SUPPORTS SHALL BE FABRICATED FROM STRUCTURAL STEEL AND SHALL CONFORM TO THE BREAKAWAY DESIGN SHOWN ON THESE PAGES FOR STANDARD GROUND MOUNTED SIGN SUPPORTS BREAKAWAY DESIGN AND TO THE APPLICABLE REQUIREMENTS OF THE MASSACHUSETTS HIGHWAY DEPARTMENT "STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES."

STEEL

DESIGN CONFORMS WITH "AASHTO STANDARD SPECIFICATIONS FOR HIGHWAY SIGNS, LUMINAIRES, AND TRAFFIC SIGNALS."
ALL STRUCTURAL STEEL SHALL CONFORM TO ASTM-A36. FLANGE HOLES FOR FUSE BOLTS SHALL BE DRILLED.
ALL HIGH STRENGTH BOLTS, NUTS, AND WASHERS SHALL CONFORM TO ASTM-A325. TIGHTEN THE HIGH STRENGTH BOLTS IN THE BASE PLATE CONNECTION ONLY TO THE TORQUE SHOWN IN THE TABLE. DO NOT OVER TIGHTEN.
NOTCHED STEEL FUSE PLATES SHALL CONFORM TO THE REQUIREMENTS OF ASTM A36. ALL HOLES SHALL BE DRILLED, ALL PLATE CUTS SHALL BE SAW CUTS.
ALL BOLTS OTHER THAN HIGH STRENGTH BOLTS SHALL CONFORM TO ASTM-A307 CLASS A. ALL BOLTS, NUTS, AND WASHERS SHALL BE GALVANIZED AS PER ASTM-A135. STRUCTURAL STEEL SHALL BE GALVANIZED AS PER ASTM-A123 AFTER FABRICATION EXCEPT AS NOTED.
IN ALL CASES THE BOTTOM OF THE FOOTING SHALL BE PLACED TO THE DESIGN DEPTH.

ALUMINUM

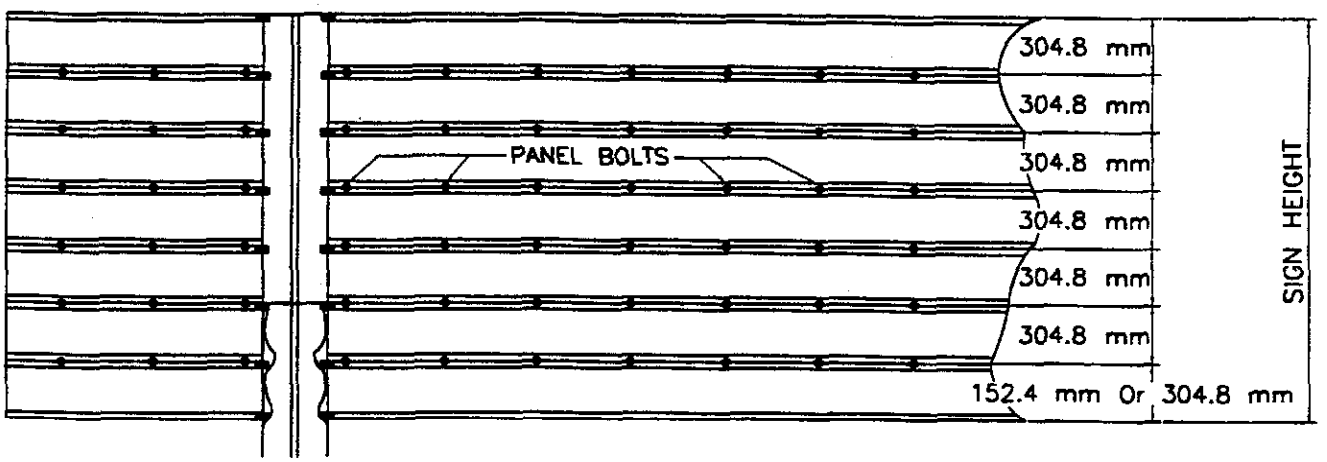
PANELS, ATTACHMENTS, AND HARDWARE SHALL CONFORM TO THE REQUIREMENTS OF M.H.D. SPECIFICATIONS.



NOTE: ALL EXTRUDED ALUMINUM PANELS SHALL HAVE SIDE MOULDING

ISOMETRIC SHOWING SIGN COMPONENTS

NOTE:
THE POST CLIP METHOD MAY BE USED WITH A TEE BEAM SECTION ON GROUND MOUNTED SIGNS ONLY.
THE POST CLIP MUST BE USED AT EACH ALUMINUM CHANNEL ATTACHED TO THE SIGN PANEL.
POST CLIPS SHALL NOT BE USED WITH "Z" BAR SECTIONS.
BOLTS MUST BE USED IF A "Z" BAR SECTION IS USED.



NOTE: PANEL BOLTS TO BE PLACED SYMMETRICALLY ABOUT ℄ OF SIGN

REAR ELEVATION

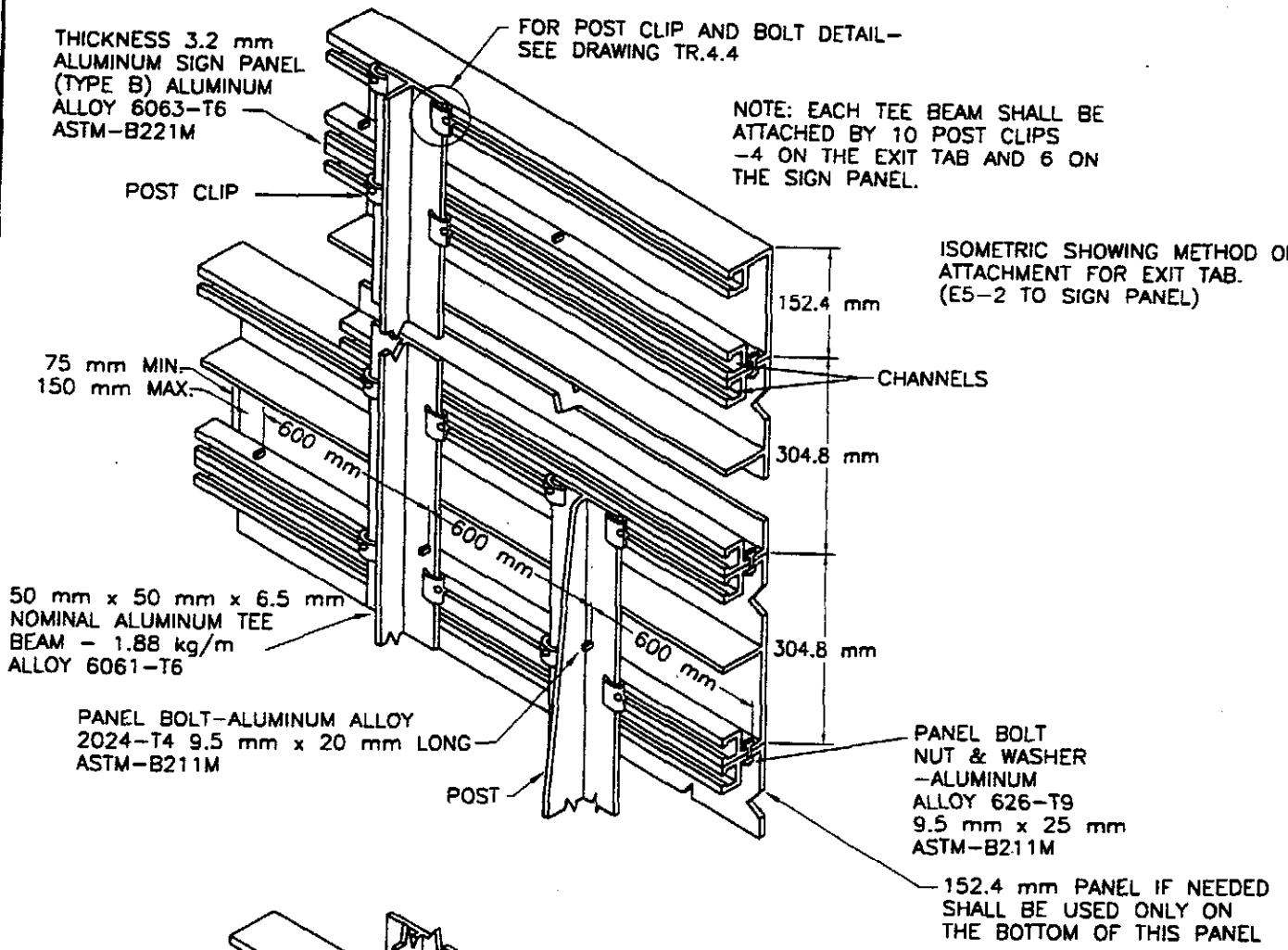
SHOWING ARRANGEMENT OF POST CLIPS (BOTH POSTS OR ALL POSTS) AND PANEL BOLTS.

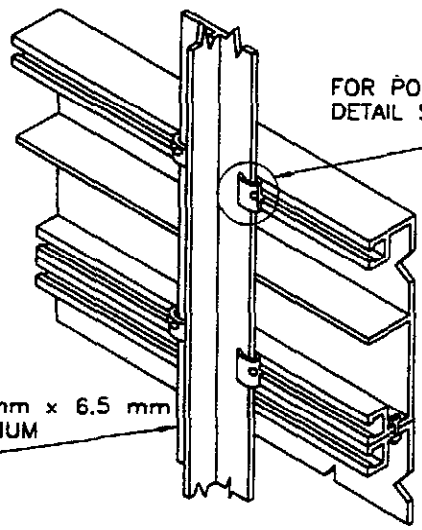
MASS HIGHWAY
SIGNS & SUPPORTS

ALUMINUM PANEL DETAILS
SIGN COMPONENTS

DATE OF ISSUE
5/13/95

DRAWING NUMBER
TR.4.2





NOTE:
THE POST CLIP METHOD MAY BE USED WITH A TEE BEAM SECTION ON GROUND MOUNTED SIGNS ONLY. THE POST CLIPS MUST BE USED AT EACH ALUMINUM CHANNEL ATTACHED TO THE SIGN PANEL.
POST CLIPS SHALL NOT BE USED WITH "Z" BAR SECTIONS.
BOLTS MUST BE USED IF A "Z" BAR SECTION IS USED.

MASS HIGHWAY
SIGNS & SUPPORTS

ALUMINUM PANEL DETAILS METHOD OF ATTACHMENT FOR EXIT TAB

DATE OF ISSUE 5/13/95

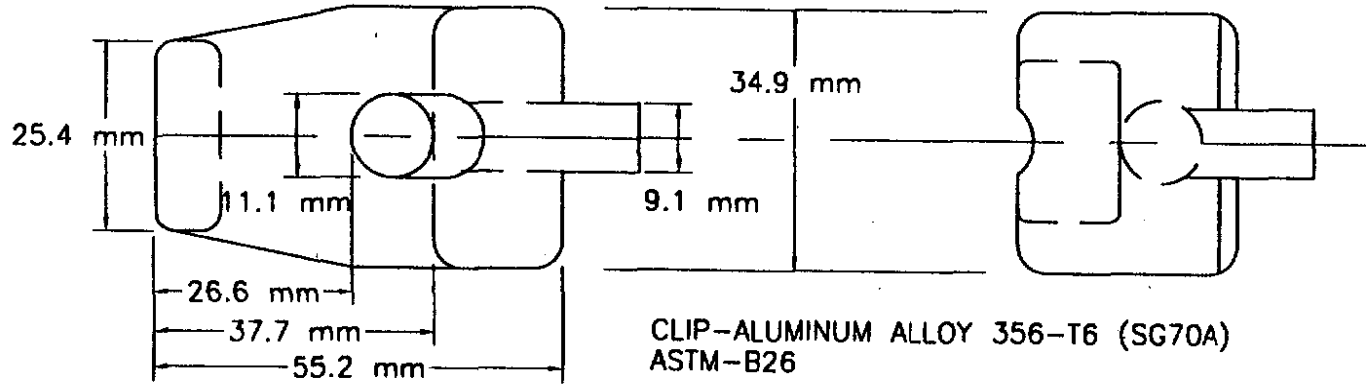
DRAWING NUMBER **TR.4.3**

MASS HIGHWAY
SIGNS & SUPPORTS

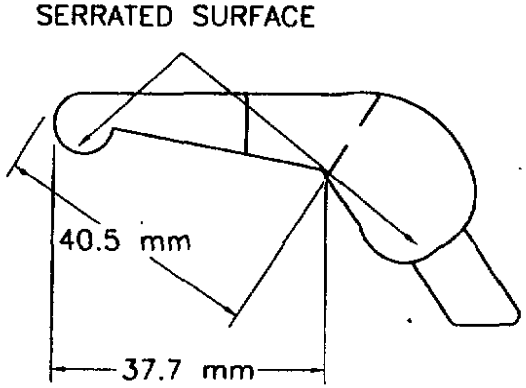
ALUMINUM PANEL DETAILS
POST CLIP AND BOLT DETAIL
(FOR EXTRUDED ALUMINUM)

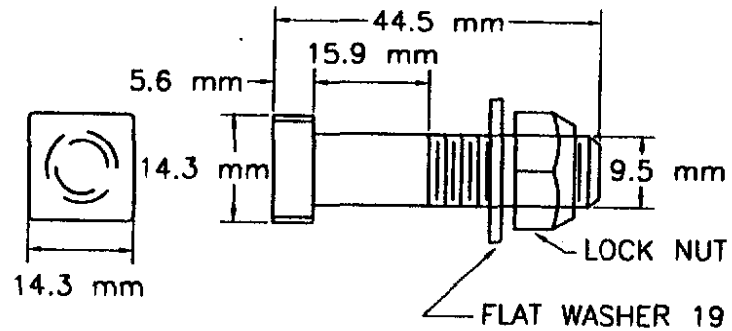
DATE OF ISSUE 5/13/95

DRAWING NUMBER **TR.4.4**



CLIP–ALUMINUM ALLOY 356–T6 (SG70A)
ASTM–B26





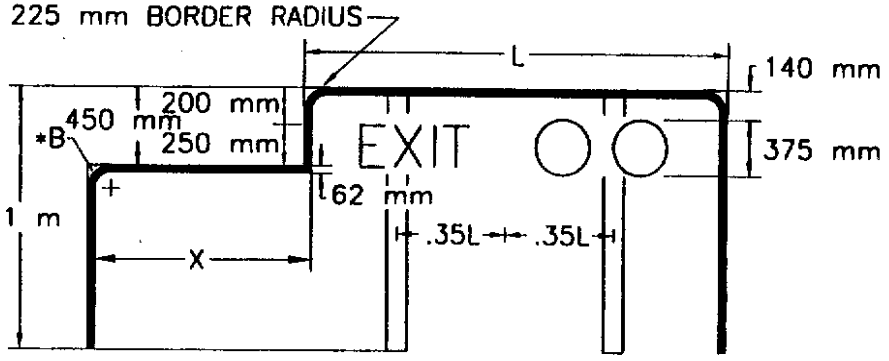
MACHINE
BOLT–STAINLESS STEEL ALLOY 304
ASTM–A–193–GRADE B8 OR
ASTM–A–194–GRADE 8
NUT–STAINLESS STEEL ALLOY 303
ASTM–A–193–GRADE B 8F OR
ASTM–A–194–GRADE 8F

MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL EXIT TAB AND GORE SIGN

DATE OF ISSUE 5/13/95

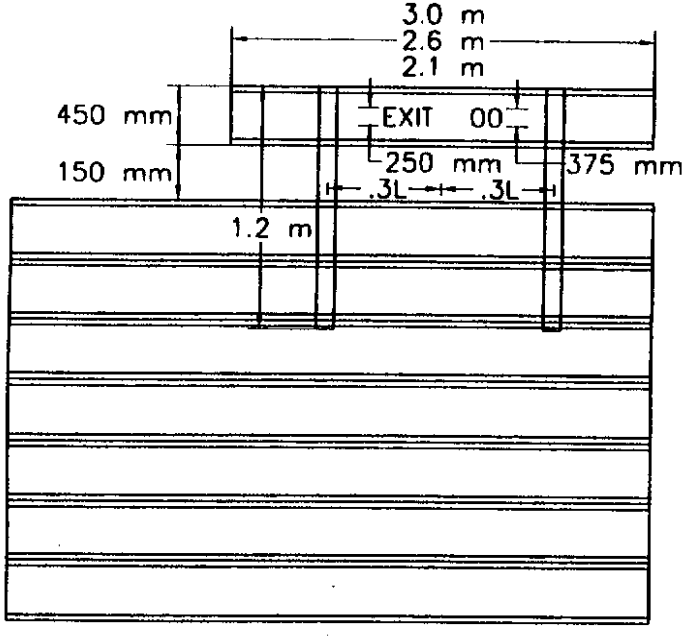
DRAWING NUMBER **TR.4.5**



*B HEIGHT OF SIGN	RADIUS
UP TO 600 mm	75 mm
750 mm TO 1.2 m	150 mm
1.3 m TO 1.8 m	225 mm
1.9 m & OVER	300 mm

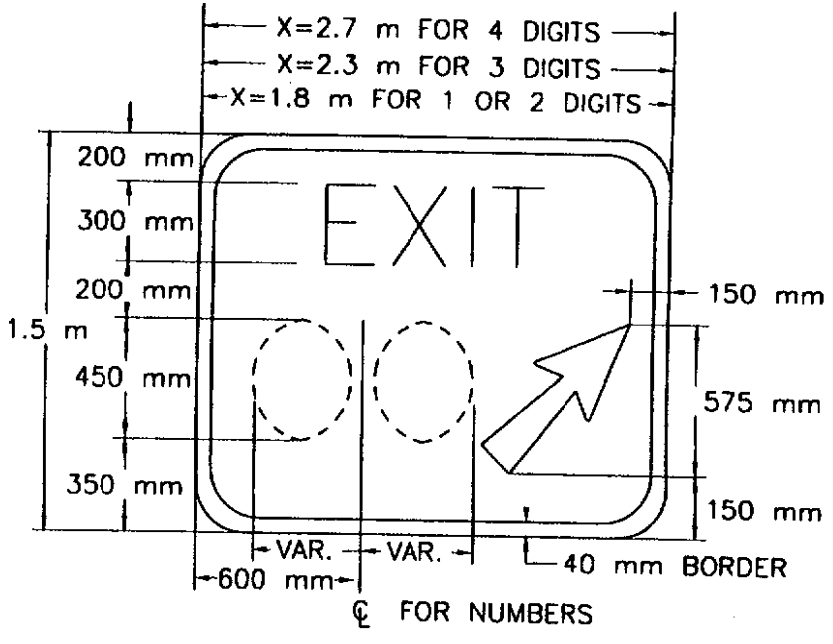
THE MINIMUM DISTANCE FOR X SHALL BE 300 mm.

ONE	DIGIT	(EXIT 0)	L=2.1 m
TWO	DIGITS	(EXIT 00)	L=2.6 m
THREE	DIGITS	(EXIT 000)	L=3.0 m
FOUR	DIGITS	(EXIT 0000)	L=3.6 m



TYPICAL EXIT TAB ATTACHED TO SIGN PANEL

E1-5



LEGEND & BORDER---WHITE (REFLECTIVE)
BACKGROUND--------GREEN (REFLECTIVE)
ARROW DESIGN-------"A"

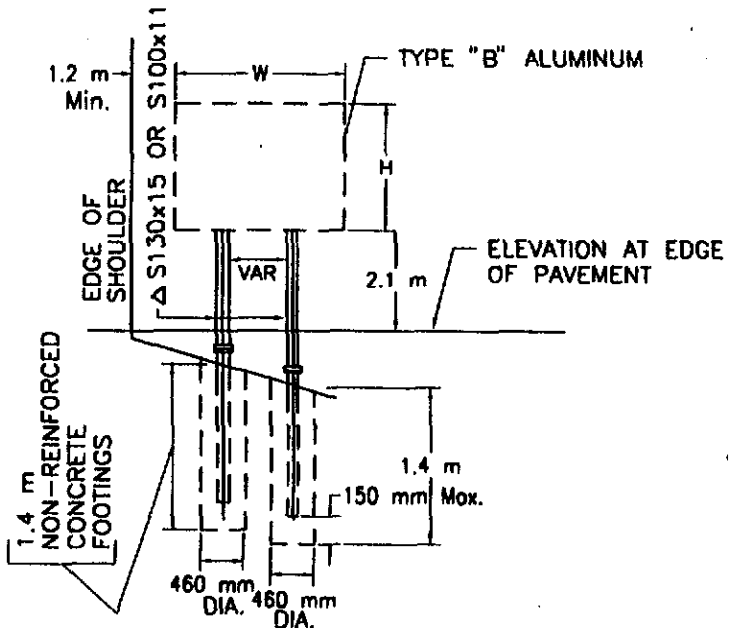
E5-1A

MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL INSTALLATION FOR SIGNS WITH AREA OVER 2.0 SQUARE METERS

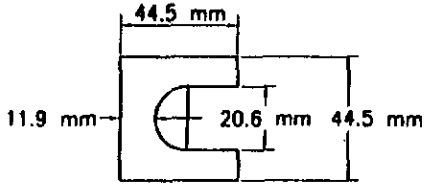
DATE OF ISSUE 5/13/95

DRAWING NUMBER TR.4.6



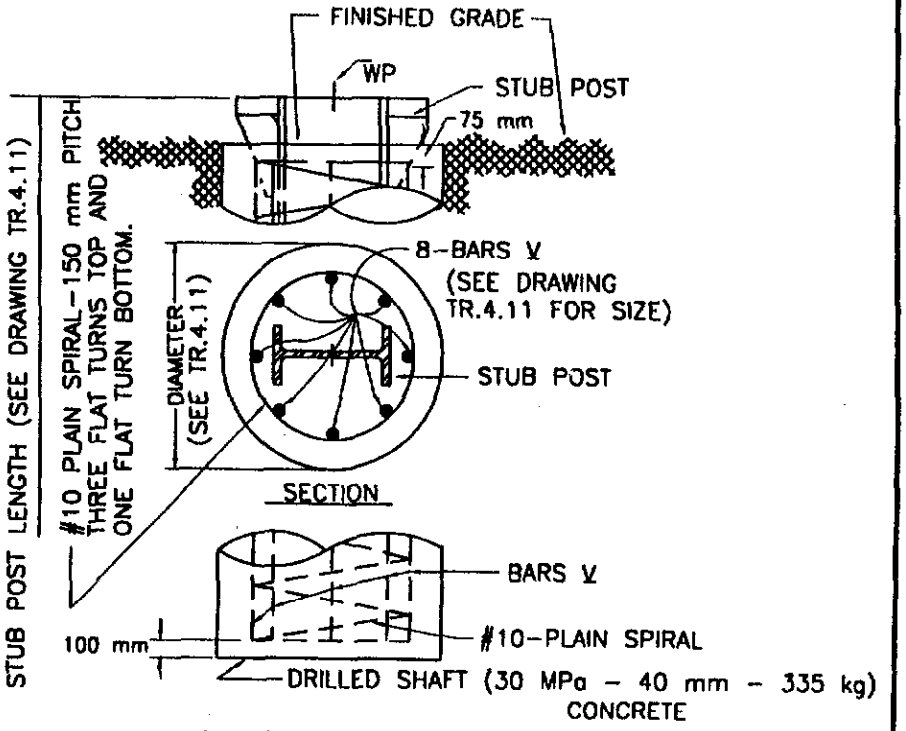
TYPICAL INSTALLATION FOR SIGNS WITH AREA OVER 2.0 SQ. METERS UP TO 4.0 SQ. METERS

NOTE:- EAST OF LONGITUDE 71°-41' USE S 130 x 15 POSTS.
WEST OF LONGITUDE 71°-41' USE S 100 x 11 POSTS.
SPACING OF POSTS AND FOUNDATION DETAIL AS SHOWN FOR SIGNS UP TO 1.5 m IN WIDTH
OVER 1.5 m IN WIDTH SPACING BETWEEN POSTS= 0.6 x WIDTH
FOR BASE CONNECTION AND FUSE PLATE DATA SEE DRAWING TR.4.11

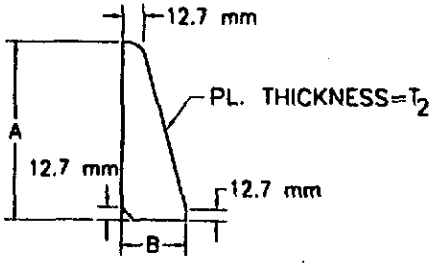


FURNISH 2-0.3 mm± THICK AND 2-0.8 mm± THICK SHIMS PER POST. SHIMS SHALL BE FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM-B36

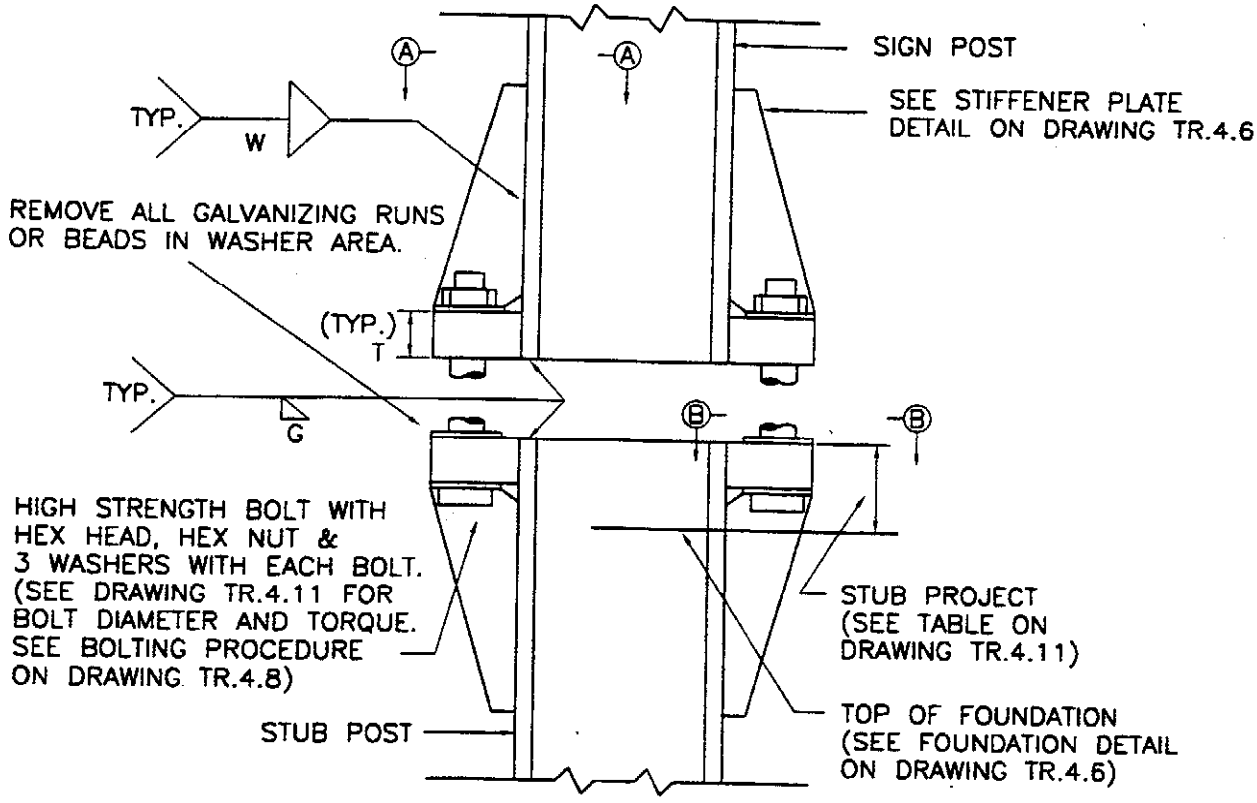
SHIM DETAIL

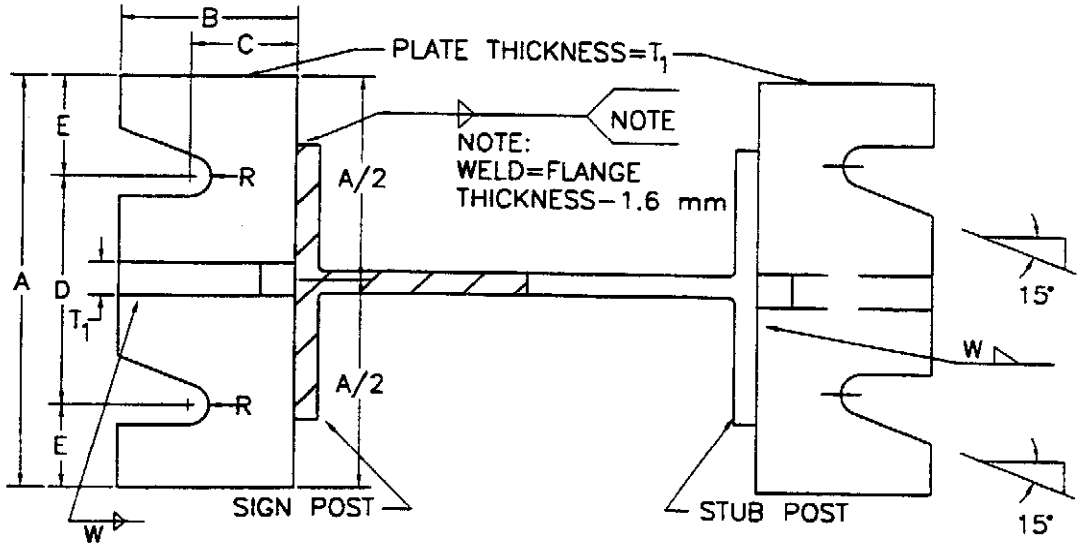


FOUNDATION DETAILS
FOR SIGNS WITH AREA OVER 4.0 SQUARE METERS



STIFFENER PLATE DETAIL
SEE DRAWING TR.4.11 FOR DIMENSIONS





SECTION A–A

SECTION B–B

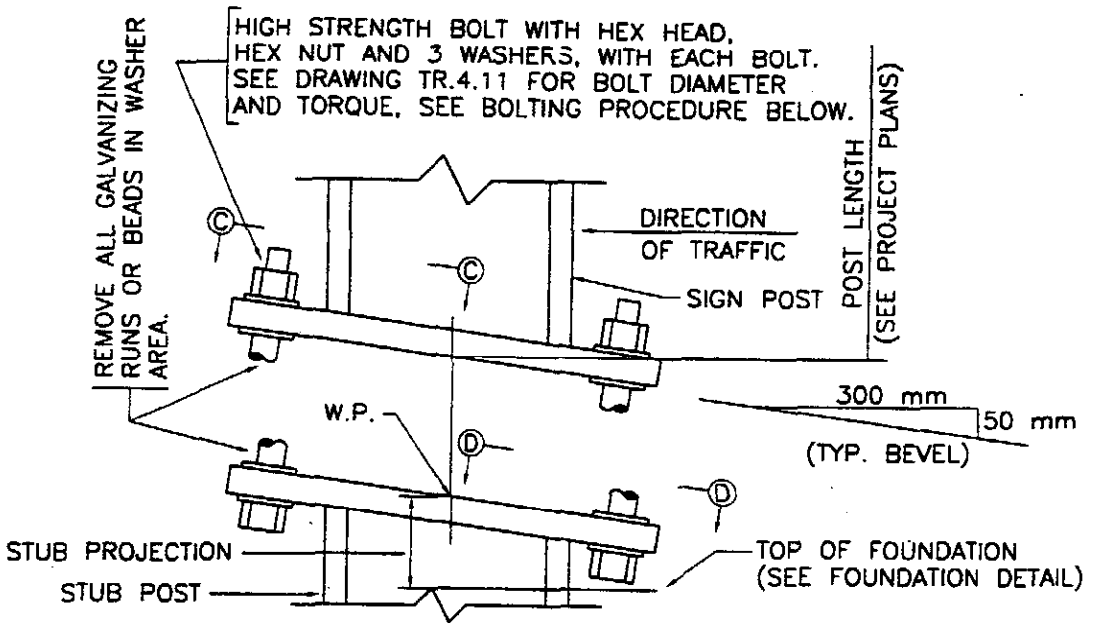
SEE TABLE ON DRAWING TR.4.11 FOR DIMENSIONS.
SECTIONS SHOWN ARE FOR INSTALLATIONS ON RIGHT SHOULDER AND IN GORE. FOR INSTALLATIONS ON LEFT SHOULDER, PLATE AND SLOT BEVELS ARE OPPOSITE HAND.

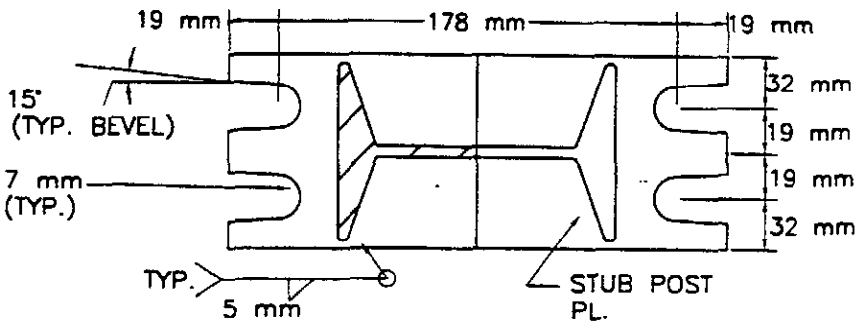
MASS HIGHWAY
SIGNS & SUPPORTS

SIGN POST AND STUB POST FOR W SHAPE

DATE OF ISSUE
5/13/95

DRAWING NUMBER
TR.4.7





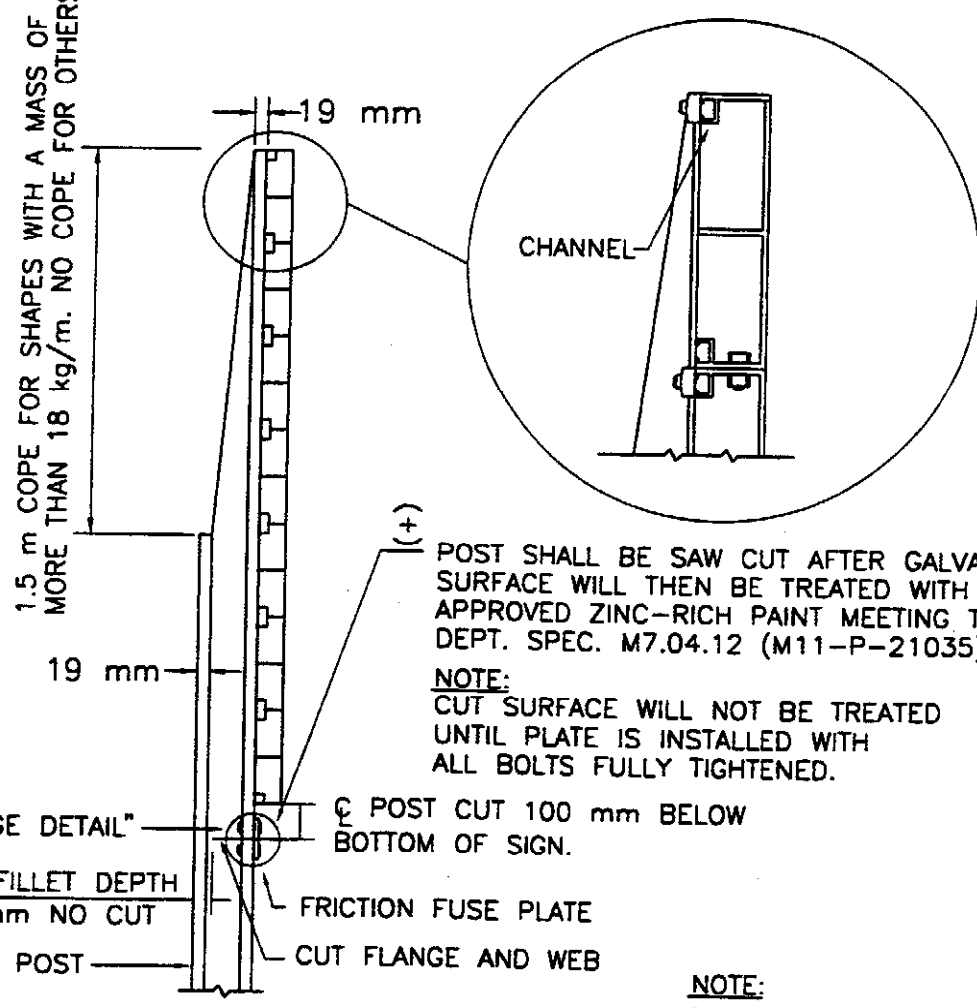
SECTION C–C SECTION D–D

SECTIONS SHOWN ARE FOR INSTALLATIONS ON THE RIGHT SHOULDER AND IN GORE. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATION ON LEFT SHOULDER.

PROCEDURE FOR ASSEMBLY OF BASE CONNECTION

1. ASSEMBLE POST TO STUB WITH BOLTS AND WITH ONE FLAT WASHER ON EACH BOLT BETWEEN PLATES.
2. SHIM AS REQUIRED TO PLUMB POST.
3. TIGHTEN ALL BOLTS THE MAXIMUM POSSIBLE WITH 300 TO 380 mm WRENCH TO BED WASHERS AND SHIMS AND TO CLEAN BOLT THREADS, THEN LOOSEN EACH IN TURN AND RETIGHTEN IN A SYSTEMATIC ORDER TO THE PRESCRIBED TORQUE. (SEE TABLE ON DRAWING TR.4.11)
4. AFTER THE INITIAL TORQUING A SECOND NUT WILL BE USED TO INSURE THAT THE FIRST NUT WILL NOT BACK OFF.
5. THE CONTRACTOR TOGETHER WITH A DEPARTMENT INSPECTOR WILL RETURN TO THE SIGN FOR TWO INTERVALS OF 30± DAYS FOR THE PURPOSE OF MAINTAINING THE PRESCRIBED TORQUE.
6. IMMEDIATELY AFTER THE SECOND RE–TORQUING, THE TOP NUT SHALL BE REMOVED AND THE THREAD SHALL BE BURRED JUST ABOVE THE FIRST NUT USING A CENTER PUNCH, IN ORDER TO ENSURE THAT THE PRESCRIBED TORQUE IS MAINTAINED.

MASS HIGHWAY SIGNS & SUPPORTS	SIGN POST & STUB POST FOR S100X11 AND S130X15 SHAPES	DATE OF ISSUE 5/13/95
		DRAWING NUMBER **TR.4.8**

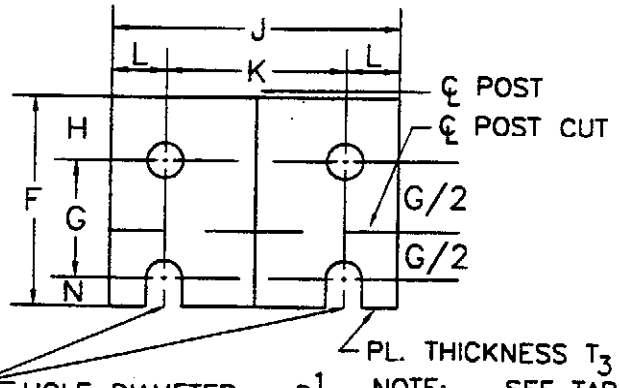


POST SHALL BE SAW CUT AFTER GALVANIZING. SURFACE WILL THEN BE TREATED WITH AN APPROVED ZINC-RICH PAINT MEETING THE DEPT. SPEC. M7.04.12 (M11-P-21035).

NOTE:
CUT SURFACE WILL NOT BE TREATED UNTIL PLATE IS INSTALLED WITH ALL BOLTS FULLY TIGHTENED.

SIDE VIEW

NOTE:
THE POST CLIP METHOD MAY BE USED WITH A TEE BEAM SECTION ON GROUND MOUNTED SIGNS ONLY. THE POST CLIPS MUST BE USED AT EACH ALUMINUM CHANNEL ATTACHED TO THE SIGN PANEL.
POST CLIPS SHALL NOT BE USED WITH "Z" BAR SECTIONS.
BOLTS MUST BE USED IF A "Z" BAR SECTION IS USED.



HOLE DIAMETER = D^1 NOTE: - SEE TABLE (DRAWING TR.4.11) FOR DIMENSIONS & MASS

USE HIGH STRENGTH BOLTS WITH HEX. HEAD & HEX NUT, ONE FLAT WASHER UNDER EACH BOLT HEAD AND BEVEL OR FLAT WASHER (WHERE REQUIRED) UNDER NUT.

FUSE PLATE DETAIL

MASS HIGHWAY
SIGNS & SUPPORTS

POST COPING & FUSE PLATE DETAILS

DATE OF ISSUE
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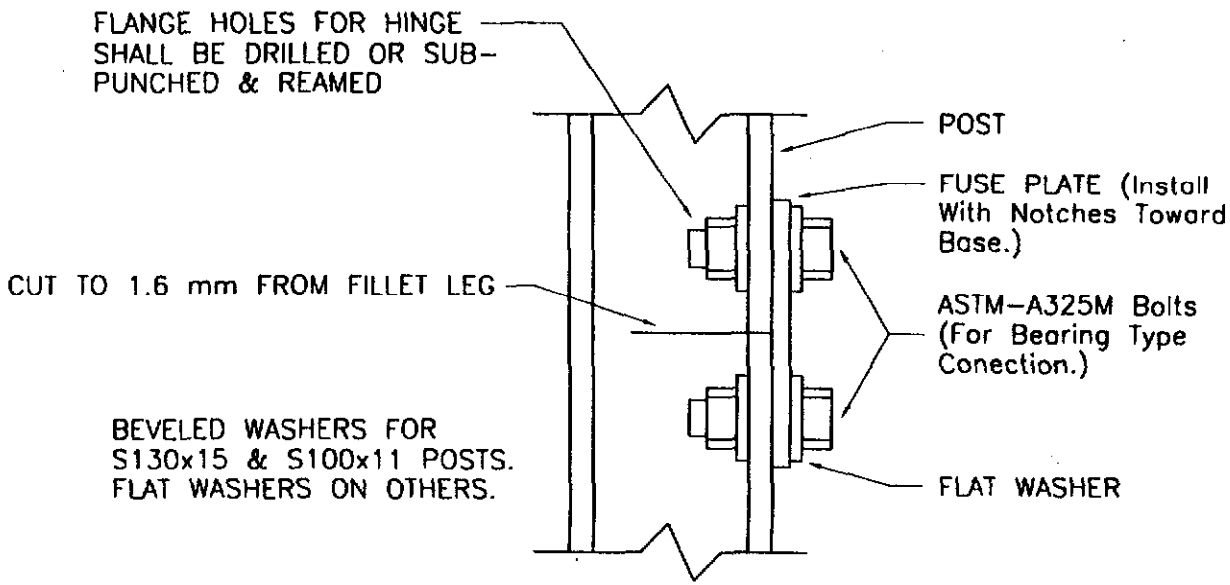
DRAWING NUMBER
TR.4.9

MASS HIGHWAY
SIGNS & SUPPORTS

HINGE DETAIL



FIELD NOTE: ALL FUSE PLATE BOLTS SHALL BE 70 mm IN LENGTH AND HAVE 60 mm OF THREAD ON THE END OF THE BOLT. ALL FRICTION FUSE BOLTS SHALL BE TIGHTENED IN THE PRESENCE OF THE DEPARTMENT'S REPRESENTATIVE IN THE FIELD AND IN ACCORDANCE WITH THE REQUIREMENTS OF ARTICLE 2.10.20, WITH A WRENCH CALIBRATED DAILY AT THE CONTRACTOR'S EXPENSE AT THE PROJECT SITE WITH A HYDRAULIC BOLT TENSION CALIBRATOR TO OBTAIN THE FOLLOWING TENSION IN EACH BOLT.

REFER TO	BOLT SIZE	TENSION
DRAWING	12.7 mm	TENSIONS TO BE
TR.4.9	M16	FURNISHED LATER.
FUSE PLATE	19.0 mm	TESTING IS CURRENTLY
DETAIL	M22	UNDERWAY.

THIS INSTALLATION PROCEDURE SHALL COMPRISE THE INSPECTION REQUIRED BY THE ABOVE MENTIONED SPECIFICATION. FABRICATOR SHALL ASSEMBLE THE SIGNS IN THE SHOP WITH SUITABLE ERECTION BOLTS FOR SHIPMENT TO THE PROJECT WHEREUPON SAID BOLTS SHALL BE REPLACED WITH THE SPECIFIED HIGH-STRENGTH BOLTS AND TESTED TO THE VALUES SHOWN ABOVE. INSPECTION SHALL BE IN ACCORDANCE WITH THE ABOVE MENTIONED ARTICLE 2.10.20 EXCEPT THAT THE INSPECTION WRENCH SHALL BE A TORQUE WRENCH AND THAT ALL BOLTS INSTALLED ON THE VARIOUS FUSE PLATES SHALL BE INSPECTED.

DRAWING NUMBER **TR.4.10**

DATE OF ISSUE 5/13/95

BASE CONNECTION DATA TABLE

DIMENSION / POST SIZE	BOLT SIZE & TORQUE	A mm	B mm	C mm	D mm	E mm	T_1 mm	T_2 mm	W mm	R mm
W150 X 18	M16 x 80 mm WITH 45 mm THREAD TORQUE*	127	51	32	70	29	19	13	6	8.5
W150 X 22										
W200 X 27										
W250 X 33	M20 x 100 mm WITH 50 mm THREAD TORQUE*	152	57	35	89	32	25	19	8	10.5
W250 X 39										
W310 X 33										
W310 X 39										
W310 X 45		203	70	41	140	32	25	19	5	13.5
W310 X 60										
S 100 X 11	M16 x 80 mm WITH 50 mm THREAD TORQUE*	SEE DETAIL DRAWING TR.4.8 *TORQUE TO BE DETERMINED LATER								
S 130 X 15										

SEE DRAWING TR.4.7 AND DRAWING TR.4.8 FOR BASE PLATE ASSEMBLY

FUSE PLATE DATA TABLE

DIMENSION / POST SIZE	F mm	G mm	H mm	J mm	K mm	L mm	N mm	D_1 mm	T_3 mm	BOLT SIZE	WT. OF EACH FUSE(Kg) PL.
W150 X 18	95	51	32	102	57	22	16	17	10	M16	0.73
W150 X 22	114	64	32	152	89	32	19	21	13	M20	1.70
W200 X 27	114	64	32	133	70	32	19	21	13	M20	1.48
W250 X 33	137	76	38	146	70	38	22	24	13	M22	2.15
W250 X 39	137	76	38	146	70	38	22	24	13	M22	2.17
W310 X 33	137	76	38	165	89	38	22	24	13	M22	2.46
W310 X 39	137	76	38	165	89	38	22	24	13	M22	2.46
W310 X 45	137	76	38	165	89	38	22	24	13	M22	2.46
W310 X 60	149	76	38	203	127	38	35	27	13	M24	2.78
S 100 X 11	79	38	29	67	38	14	13	14	6	12.7 mm	0.29
S 130 X 15	79	38	29	67	38	14	13	14	6	12.7 mm	0.29

SEE DRAWING TR.4.9 FOR FUSE PLATE DETAILS

FOUNDATION DATA

DIMENSION / POST SIZE	STUB LENGTH	STUB PROJ.	DR. SHAFT DIA.	BARS V SIZE	DEPHT CONC. SHAFT	• ALTERNATE DIA.	• ALTERNATE DEPTH
W150 X 18	0.61 m	75 mm	610 mm	#15	1.7 m	—	—
W150 X 22	0.61 m	75 mm	610 mm	#15	2.0 m	635 mm	1.8 m
W200 X 27	0.76 m	75 mm	610 mm	#20	2.1 m	635 mm	1.8 m
W250 X 33	0.91 m	65 mm	610 mm	#25	2.9 m	760 mm	1.8 m
W250 X 39	0.91 m	65 mm	610 mm	#30	3.0 m	760 mm	1.8 m
W310 X 33	0.91 m	65 mm	610 mm	#35	3.2 m	915 mm	1.8 m
W310 X 39	0.91 m	65 mm	610 mm	#35	3.4 m	915 mm	1.8 m
W310 X 45	0.91 m	65 mm	610 mm	#35	3.7 m	915 mm	1.8 m
W310 X 52	0.91 m	65 mm	760 mm	#35	3.7 m	915 mm	1.8 m
S 100 X 11	0.46 m	90 mm	460 mm	#15	1.2 m		
S 130 X 15	0.46 m	90 mm	460 mm	#15	1.5 m		

SEE DRAWING TR.4.6 FOR FOUNDATION DETAILS

* IF ROCK, LEDGE OR WATER ENCOUNTERED, ALTERNATE FOOTINGS MAY BE EMPLOYED ONLY WITH THE WRITTEN APPROVAL OF THE ENGINEER.

MASS HIGHWAY
SIGNS & SUPPORTS

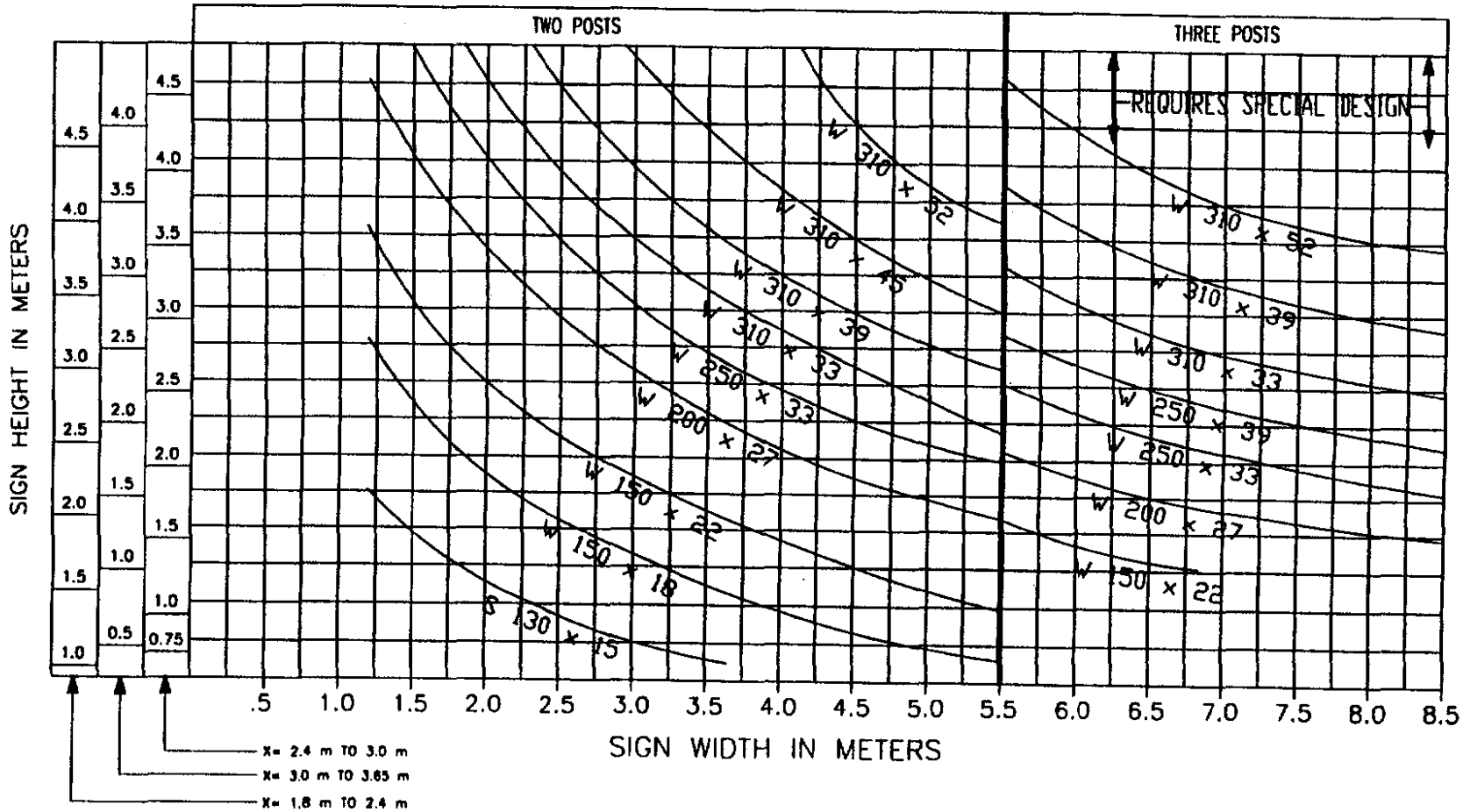
BASE CONNECTION FUSE PLATE & FOUNDATION DATA TABLES

DATE OF ISSUE 5/13/95

DRAWING NUMBER **TR.4.11**

MASS HIGHWAY
SIGNS & SUPPORTS

SIGN POST SIZING CHART
WIND ZONE 1



NOTE: "X" EQUALS THE AVERAGE HEIGHT FROM THE GROUND LINE TO THE BOTTOM EDGE OF THE SIGN AT POST LOCATIONS. MAXIMUM DISTANCE 3.65 m.

NOTE: THESE CHARTS TO BE USED WHERE SIGN PANELS ARE OVER 4.0 SQUARE METERS.

NOTE: WHEN THE DESIGN OF A STRUCTURE FALLS BETWEEN TWO LINES ON THE CHART, ALWAYS GO UP TO THE NEXT NEAREST LINE TO CHOOSE THE SIZE OF THE SECTION.

WIND ZONE 1 EAST OF LONGITUDE 71° – 41'

V = 145 km/h, P = 170 kg/m^2 x Cd Ch

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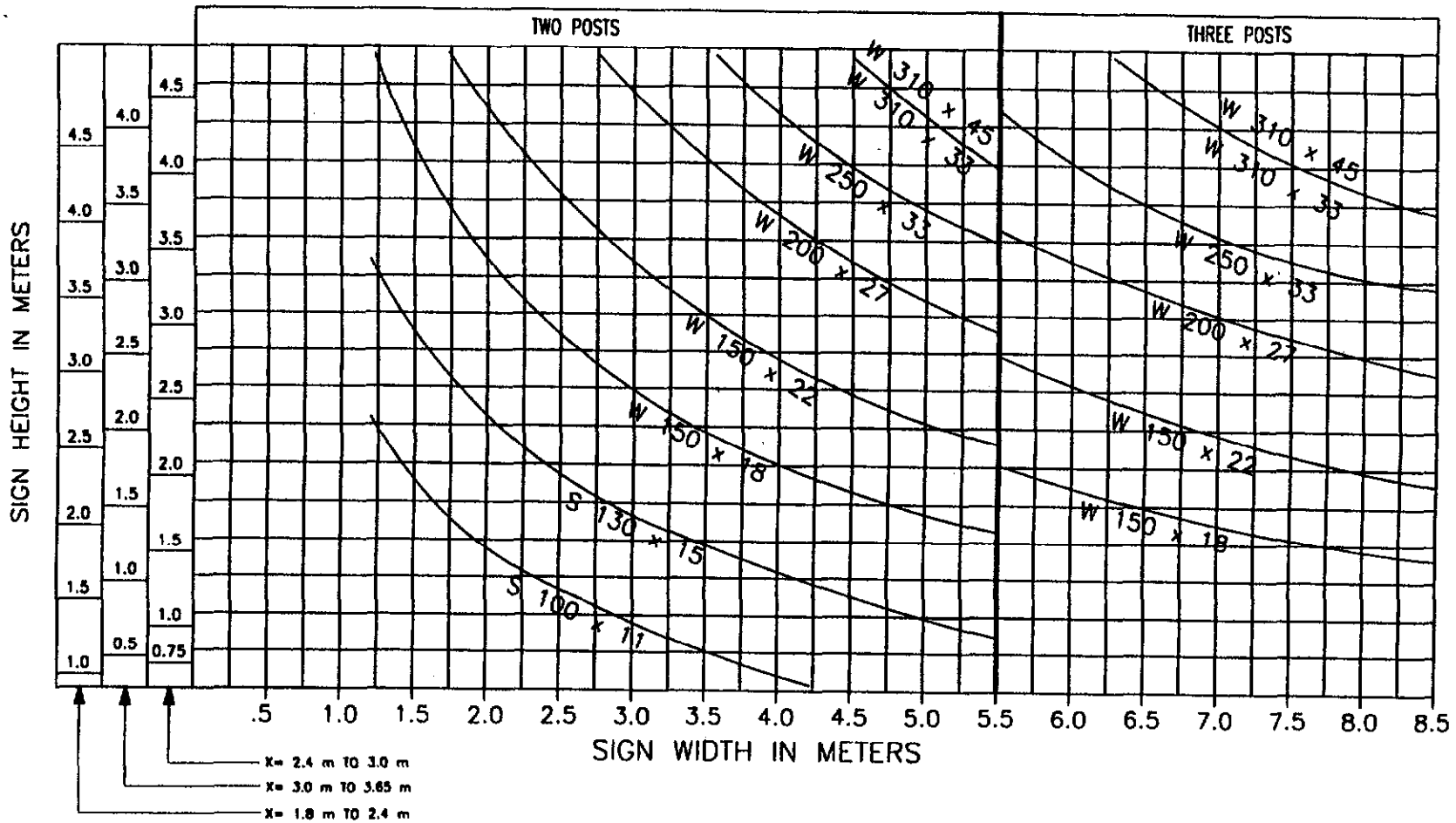
DRAWING NUMBER **TR.4.12**

MASS HIGHWAY
SIGNS & SUPPORTS

SIGN POST SIZING CHART
WIND ZONE 2



NOTE: "X" EQUALS THE AVERAGE HEIGHT FROM THE GROUND LINE TO THE BOTTOM EDGE OF THE SIGN AT POST LOCATIONS. MAXIMUM DISTANCE 3.65 m.

NOTE: THESE CHARTS TO BE USED WHERE SIGN PANELS ARE OVER 4.0 SQUARE METERS.

NOTE: WHEN THE DESIGN OF A STRUCTURE FALLS BETWEEN TWO LINES ON THE CHART, ALWAYS GO UP TO THE NEXT NEAREST LINE TO CHOOSE THE SIZE OF THE SECTION.

WIND ZONE 2 WEST OF LONGITUDE 71° – 41'

V = 110 km/h, P = 103.5 kg/m^2 x Cd Ch

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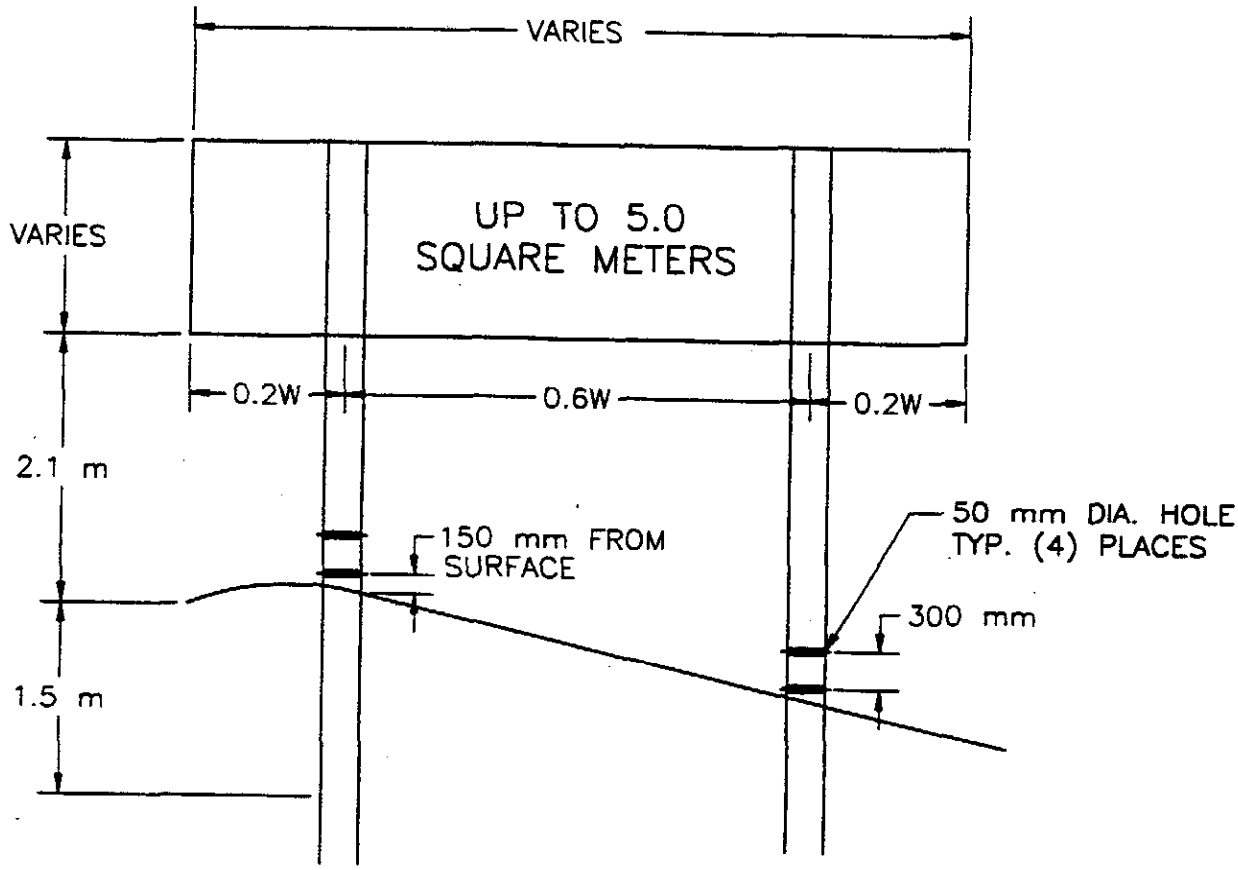
DRAWING NUMBER **TR.4.13**



NOTES:

1. FOR SIGNS OVER 5 SQUARE METERS, CALCULATIONS MUST BE SUBMITTED FOR WIND LOAD AND POST SIZE.
2. USE 150 mm X 150 mm DOUGLAS FIR OR SOUTHERN YELLOW PINE.

MASS HIGHWAY
SIGNS & SUPPORTS

TEMPORARY WOODEN YIELDING SUPPORTS

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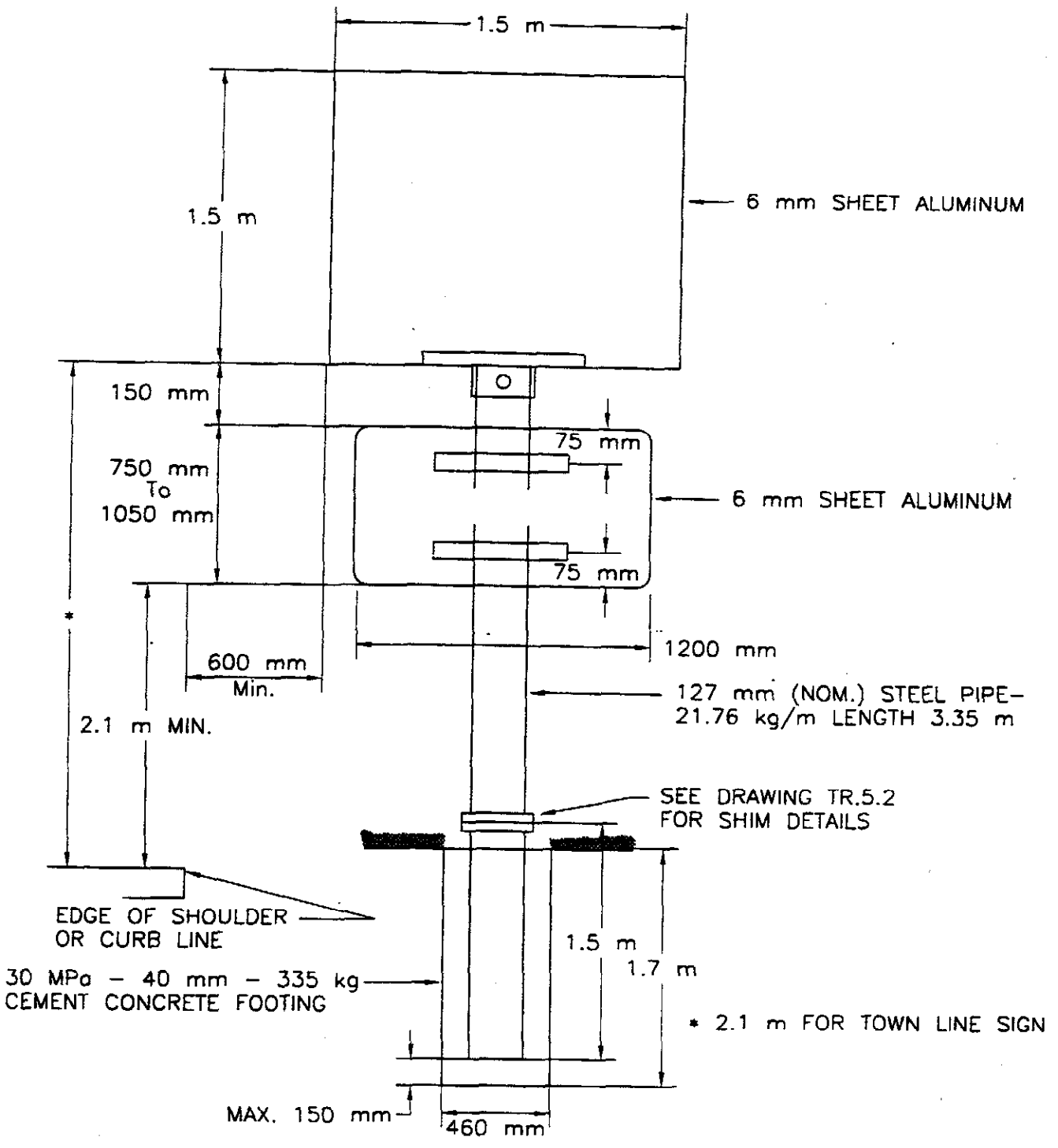
TR.4.14



MASS HIGHWAY
SIGNS & SUPPORTS

D-6 WITH D-8

DATE OF ISSUE
5/13/95

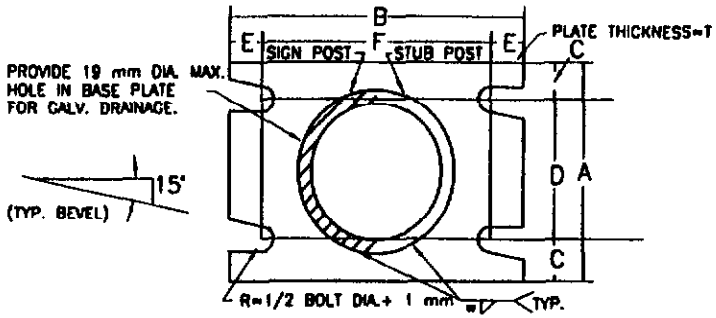
DRAWING NUMBER
TR.5.1

MASS HIGHWAY
SIGNS & SUPPORTS

D6/D8 SIGN POST AND STUB POST

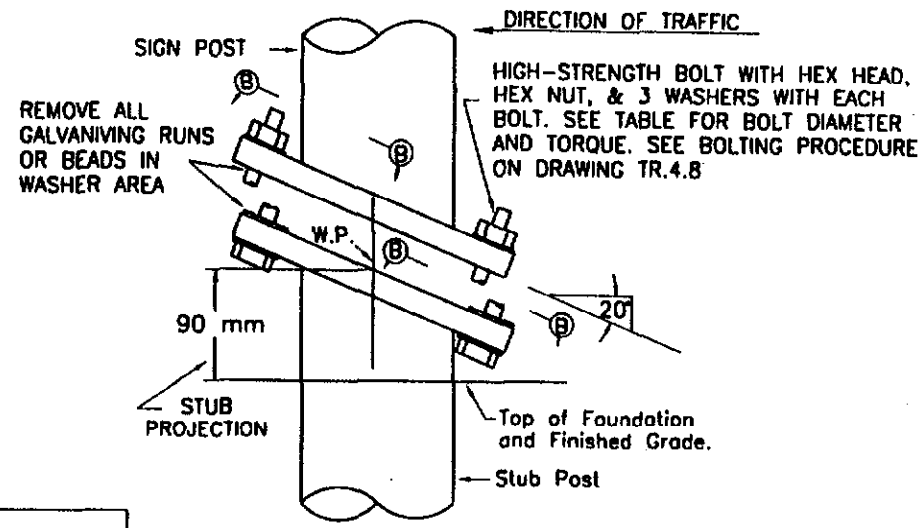
DRAWING NUMBER
TR.5.2

DATE OF ISSUE
5/13/95



SECTION A-A SECTION B-B

SECTIONS SHOWN ARE FOR INSTALLATIONS ON RIGHT SHOULDER AND IN CORE. PLATE SLOT BEVELS ARE OPPOSITE HAND FROM THAT SHOWN FOR INSTALLATIONS ON LEFT SHOULDER.



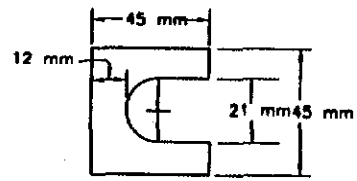
D6

BASE CONNECTION DATA TABLE									
NOM. PIPE SIZE DIMENSION	BOLT SIZE & TORQUE**	A mm	B mm	C mm	D mm	E mm	F mm	T mm	W mm
125 mm	M16 x 85 mm WITH 45 mm THREAD	165	248	32	102	22	203	25	11

*PLATES FOR BASE CONNECTION SHALL CONFORM WITH THE REQUIREMENTS OF ASTM-A36.
**TORQUE TO BE DETERMINED LATER.

GENERAL NOTES

BREAKAWAY SIGN SUPPORTS SHALL CONFORM TO THE BREAKAWAY DESIGN SHOWN ON THE SHEETS FOR GROUND MOUNTED SIGN SUPPORTS BREAKAWAY DESIGN FOR THE D-6 AND D-6 WITH D-8 SIGN AND THE MASS. HIGHWAY DEPT. "STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES."
THE STEEL POSTS SHALL BE SEAMLESS STEEL PIPE AND SHALL CONFORM TO THE ASTM DESIGNATION A53.
ALL HIGH STRENGTH BOLTS, NUTS, AND WASHERS SHALL CONFORM TO ASTM-A325.
TIGHTEN THE HIGH STRENGTH BOLTS IN THE BASE PLATE CONNECTION ONLY TO THE TORQUE SHOWN IN THE TABLE. DO NOT OVER TIGHTEN.
ALL BOLTS, OTHER THAN HIGH STRENGTH BOLTS SHALL CONFORM TO ASTM-A307 CLASS A.
ALL STEEL HARDWARE SHALL BE GALVANIZED AS PER ASTM-A153.
SEAMLESS STEEL PIPE AND BASE PLATES SHALL BE GALVANIZED AS PER ASTM-A123.
IN ALL CASES THE BOTTOM OF THE FOOTING SHALL BE PLACED TO THE DESIGN DEPTH.
THE LEGEND AND BORDER FOR D-6 SIGNS SHALL BE TYPE III OR TYPE IV REFLECTIVE SHEETING (M9.30.0)



FURNISH 2-0.30 mm± THICK AND 2-0.80 mm± THICK SHIMS PER POST. SHIMS SHALL BE FABRICATED FROM BRASS SHIM STOCK OR STRIP CONFORMING TO ASTM-B36

SHIM DETAIL

MASS HIGHWAY
SIGNS & SUPPORTS

SIGN BRACKET DETAILS FOR D-6

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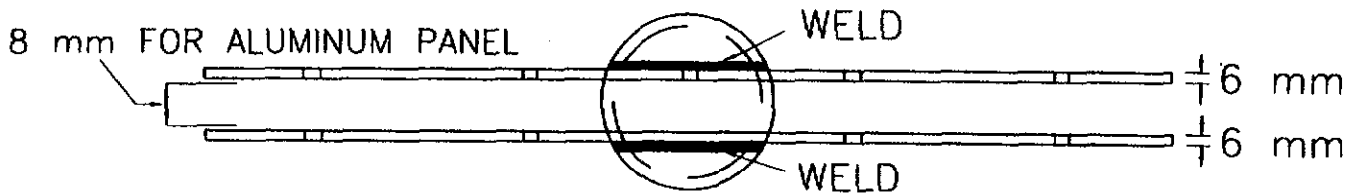
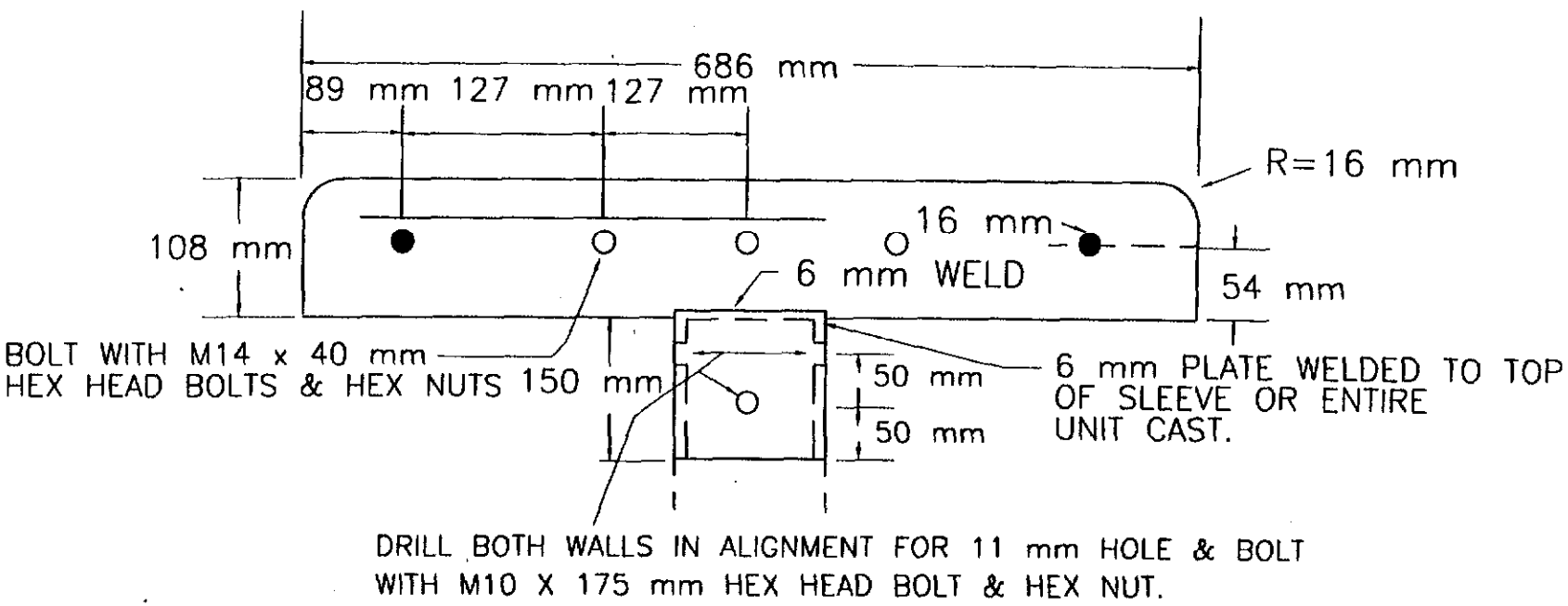
DATE OF ISSUE 5/13/95

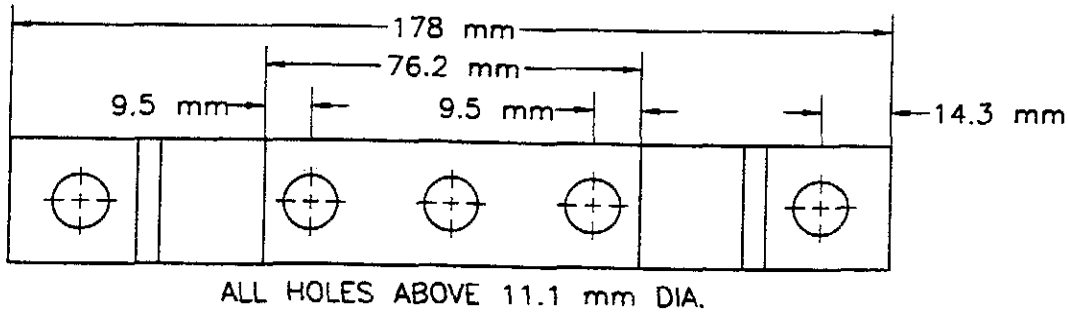
125 mm POST CAP I.D.=146 mm – 6 mm WALL THICKNESS



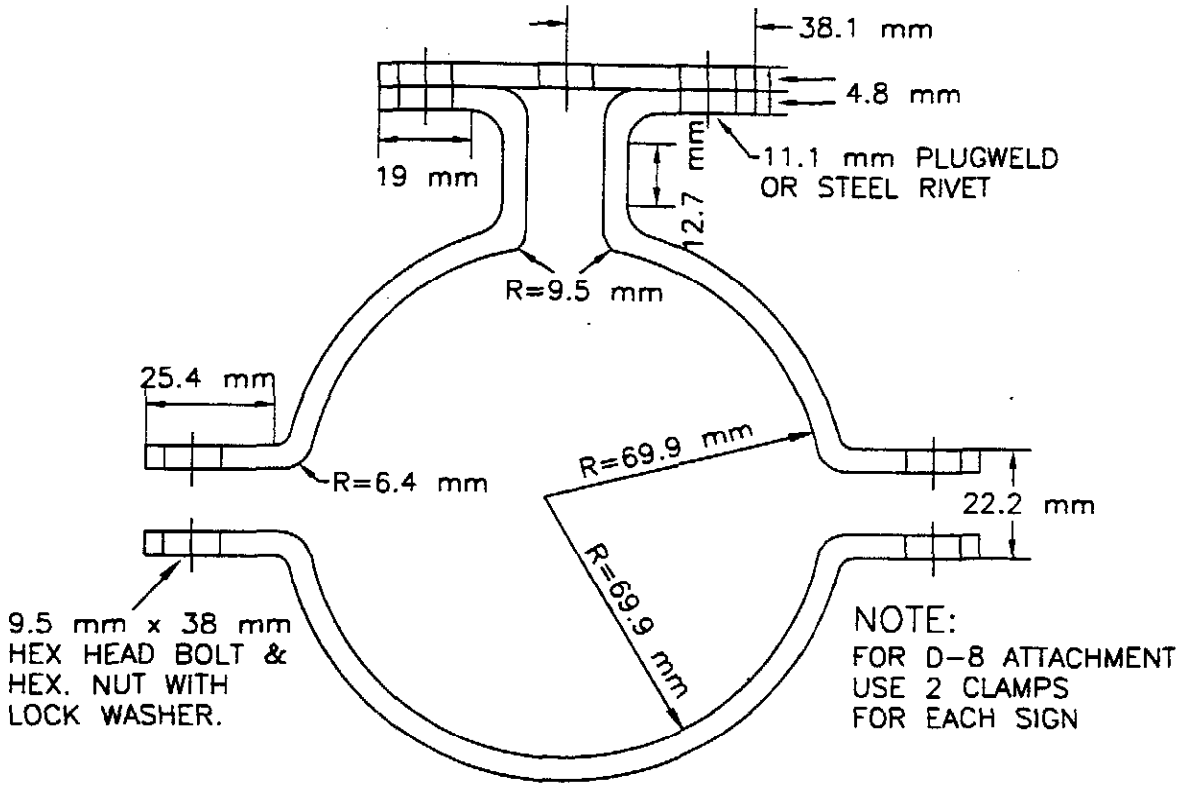
TOP VIEW



FRONT VIEW



ALL HOLES ABOVE 11.1 mm DIA.



MASS HIGHWAY
SIGNS & SUPPORTS

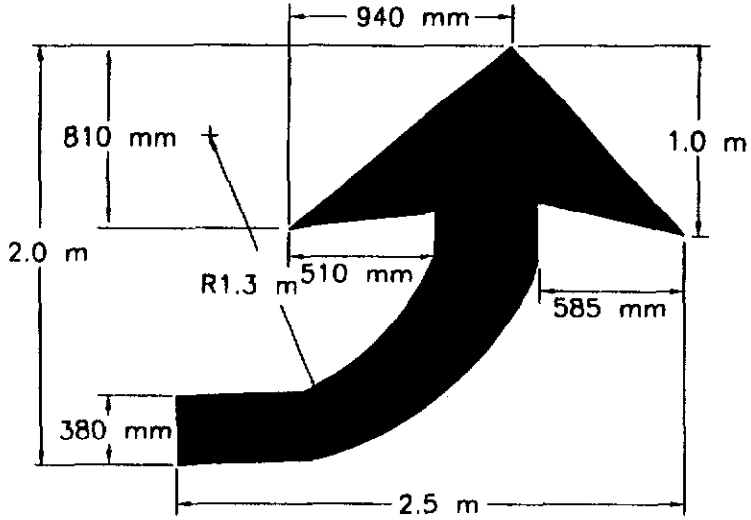
CLAMP FOR D-8 ATTACHMENT

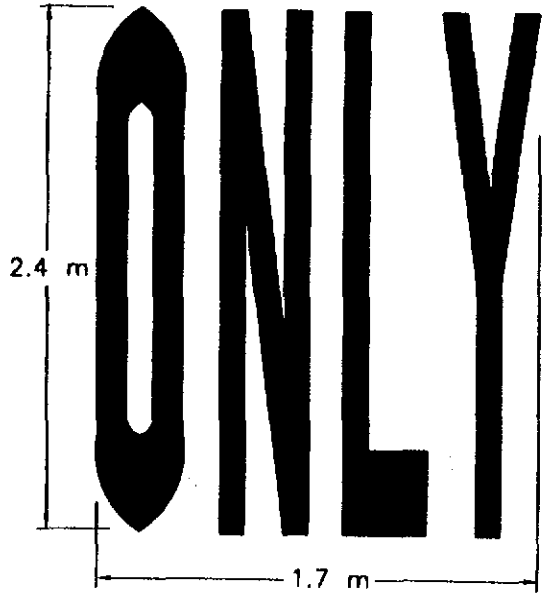
DATE OF ISSUE
5/13/95

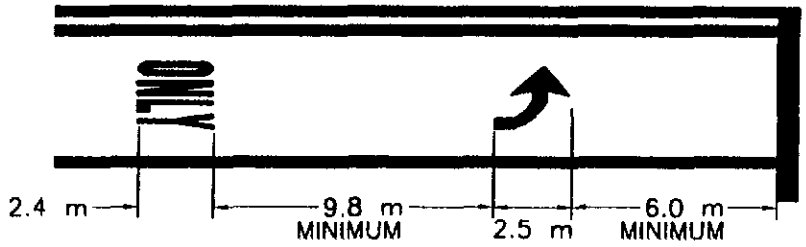
DRAWING NUMBER
TR.5.4

MASS HIGHWAY
SIGNS & SUPPORTS

PAVEMENT MARKINGS TABLE







ARROW & ONLY=APPROX. 4.3 SQ. METERS OF PAINT

ARROW & LEGEND AREA	
STRAIGHT ARROW	1.10 m^2
RIGHT OR LEFT ARROW	1.47 m^2
COMBINATION ARROW STRAIGHT AND (L OR R)	2.61 m^2
"ONLY" LEGEND	2.75 m^2

*NOTE: ALL ARROWS & LEGENDS SHALL BE WHITE.

PAVEMENT MARKINGS			
100 MILLIMETER WHITE	200 MILLIMETER WHITE	300 MILLIMETER WHITE	100 MILLIMETER YELLOW
EDGE LINE (RIGHT)	CHANNELIZING LINE (GORE)	GORE CHEVRONS	EDGE LINE (LEFT)
LANE LINE (ONE WAY TRAFFIC)		STOP LINES	CENTER LINES
TAPER LINE		CROSSWALKS	
SHOULDER LINE			
CHANNELIZING LINE			

SEE ALTERNATE MARKINGS, MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES

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DRAWING NUMBER **TR.6.1**

SINGLE BROKEN YELLOW CENTER LINE (TWO WAY PASSING ZONE)- TWO WAY YELLOW/YELLOW MARKERS SHALL BE PLACED IN LINE WITH THE SINGLE BROKEN YELLOW CENTER LINE AT AN INTERVAL NO GREATER THAN 2N, WHERE N EQUALS THE LENGTH OF ONE LINE SEGMENT PLUS ONE GAP (N = 12 METERS). THE MARKER SHALL BE PLACED MIDWAY IN THE GAP BETWEEN SUCCESSIVE MARKINGS.

DOUBLE SOLID YELLOW CENTER LINE (TWO WAY NO PASSING ZONE)- TWO WAY YELLOW/YELLOW MARKERS SHALL BE PLACED IMMEDIATELY ADJACENT TO THE TWO LINES (ONE ON EACH SIDE OF DOUBLE SOLID LINE) AT AN INTERVAL NO GREATER THAN N.

SINGLE SOLID YELLOW WITH SINGLE BROKEN YELLOW CENTER LINE (ONE WAY NO PASSING ZONE)- ONE WAY YELLOW MARKERS SHALL BE PLACED IMMEDIATELY ADJACENT TO THE SOLID YELLOW LINE AT A SPACING NO GREATER THAN N. TWO WAY YELLOW/YELLOW MARKERS, ALTERNATING WITH ONE WAY YELLOW MARKERS, SHALL BE PLACED IN LINE WITH THE SINGLE BROKEN YELLOW LINE, MIDWAY IN THE GAP BETWEEN MARKINGS, AT AN INTERVAL NO GREATER THAN N.

BROKEN WHITE LANE LINES- ONE WAY WHITE MARKERS SHALL BE PLACED IN LINE WITH THE BROKEN WHITE LINE AT AN INTERVAL OF NO GREATER THAN 2N. THE MARKER SHALL BE PLACED MIDWAY IN THE GAP BETWEEN SUCCESSIVE MARKINGS. AN EXCEPTION TO THIS SHALL BE THAT AT ON AND OFF RAMPS TWO WAY WHITE/RED MARKERS SHALL BE USED IN PLACE OF ONE WAY WHITE MARKERS BETWEEN THE GORE AND A POINT NO LESS THAN 300 METERS IN ADVANCE OF THE GORE.

SOLID WHITE GORE LINES- ONE WAY WHITE MARKERS SHALL BE PLACED IMMEDIATELY ADJACENT TO THE GORE LINE ON THE MAINLINE SIDE AT AN INTERVAL OF NO GREATER THAN N/2. TWO WAY WHITE/RED MARKERS SHALL BE PLACED IMMEDIATELY ADJACENT TO THE GORE LINE ON THE RAMP SIDE AT AN INTERVAL OF NO GREATER THAN N/2.

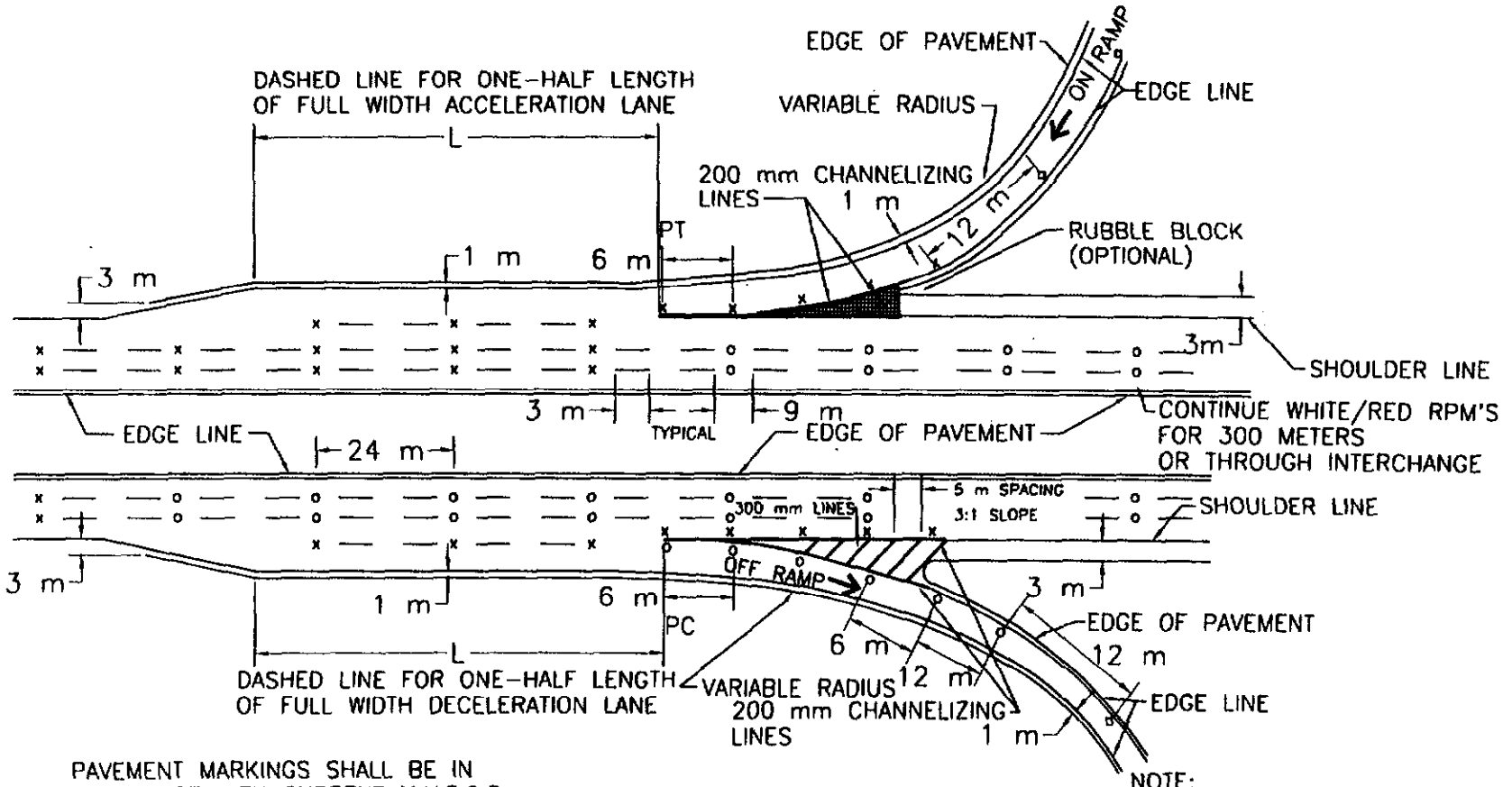
SOLID YELLOW EDGE LINES- ONE WAY YELLOW MARKERS SHALL BE PLACED IMMEDIATELY ADJACENT TO THE YELLOW EDGE LINE OF A RAMP AT AN INTERVAL OF NO GREATER THAN N/2.

SOLID WHITE EDGE LINES- SOLID EDGE LINES GENERALLY SHOULD NOT BE SUPPLEMENTED BY RAISED PAVEMENT MARKERS. IF IT IS DETERMINED THAT THE USE OF RAISED PAVEMENT MARKERS IS DESIRABLE DUE TO SPECIAL CIRCUMSTANCES THEY SHOULD BE PLACED IMMEDIATELY ADJACENT TO THE WHITE EDGE LINE AT AN INTERVAL OF NO GREATER THAN N.

MASS HIGHWAY SIGNS & SUPPORTS	RAISED PAVEMENT MARKER PLACEMENT	DATE OF ISSUE 5/13/95
		DRAWING NUMBER TR.6.2

MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL PAVEMENT MARKINGS FOR FREEWAYS



PAVEMENT MARKINGS SHALL BE IN CONFORMANCE WITH CURRENT M.U.T.C.D.

o WHITE/RED RAISED PAVEMENT MARKER
x ONE WAY WHITE RPM
◇ YELLOW/RED RPM

NOTE:
SEE DRAWING TR.6.1 FOR PAVEMENT MARKING TABLES

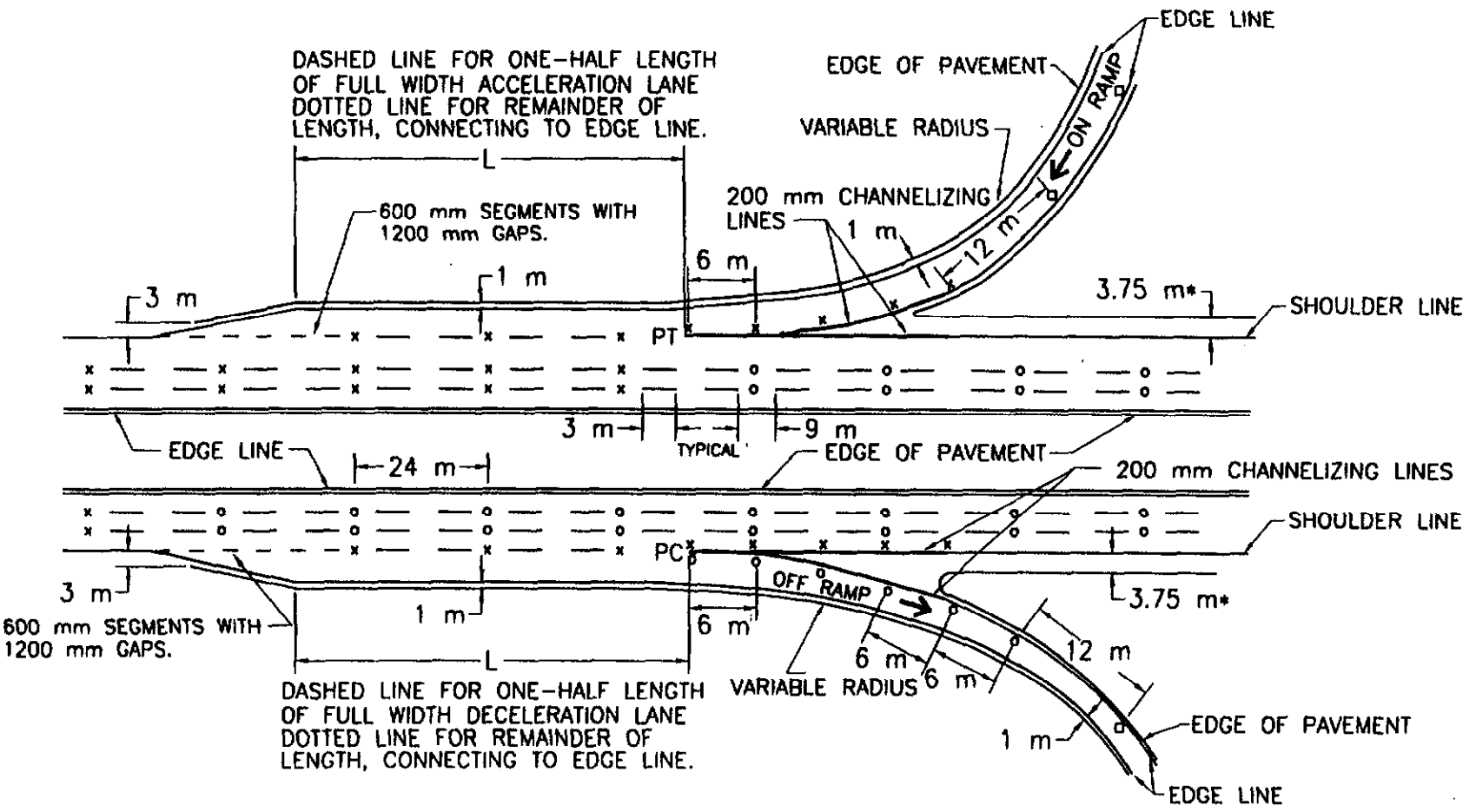
NOTE:
RED REFLECTOR IS FACED AWAY FROM ONCOMING TRAFFIC

DATE OF ISSUE 5/13/95

DRAWING NUMBER **TR.6.3**

MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL PAVEMENT MARKINGS FOR FREEWAYS WITH TRAVEL PERMITTED IN BREAK-DOWN LANE



PAVEMENT MARKINGS SHALL BE IN CONFORMANCE WITH CURRENT M.U.T.C.D.

*-DESIRABLE WIDTH SHOWN, 3.0 m IS ABSOLUTE MINIMUM.

o WHITE/RED RAISED PAVEMENT MARKER
x ONE WAY WHITE RPM
◇ YELLOW/RED RPM

NOTE:
SEE DRAWING TR.6.1 FOR PAVEMENT MARKINGS TABLE.

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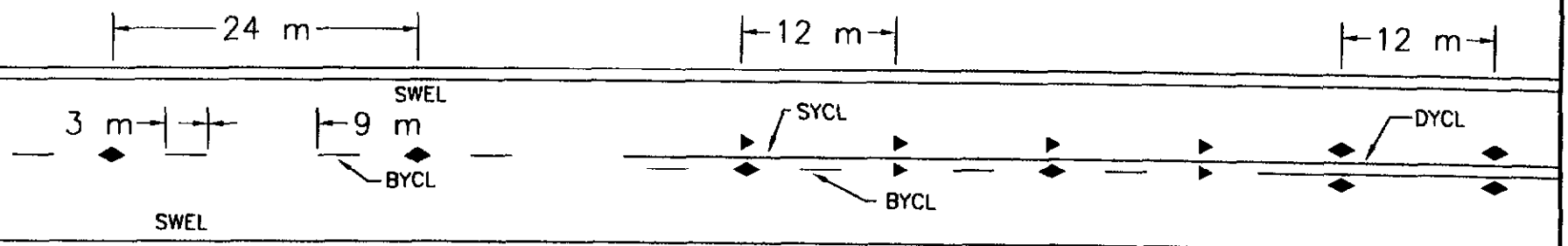
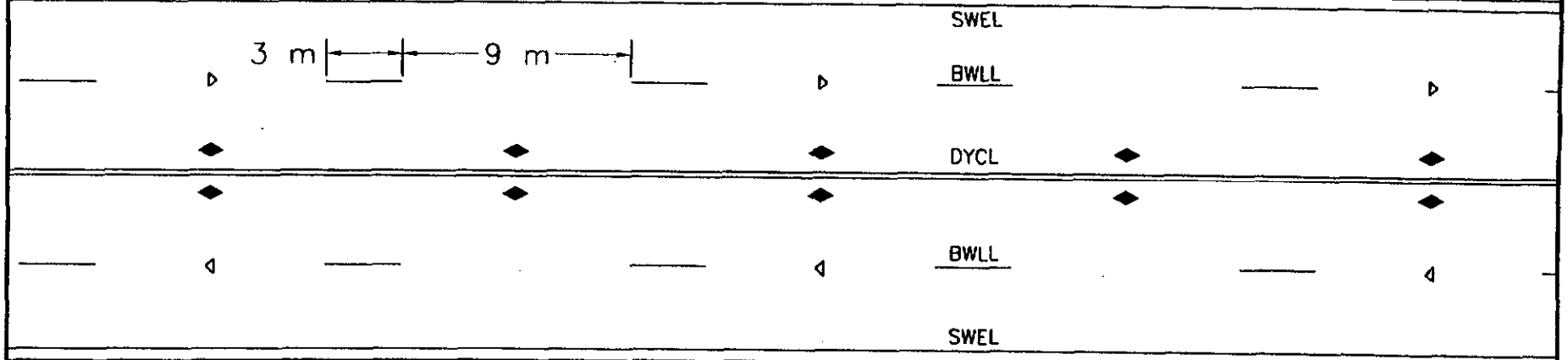
DRAWING NUMBER **TR.6.4**

MASS HIGHWAY
SIGNS & SUPPORTS

TYPICAL PAVEMENT MARKINGS FOR CONVENTIONAL ROADWAYS



TYPICAL MARKINGS FOR TWO-LANE TWO-WAY ROADWAY.



TYPICAL MARKINGS FOR FOUR-LANE TWO-WAY ROADWAY.

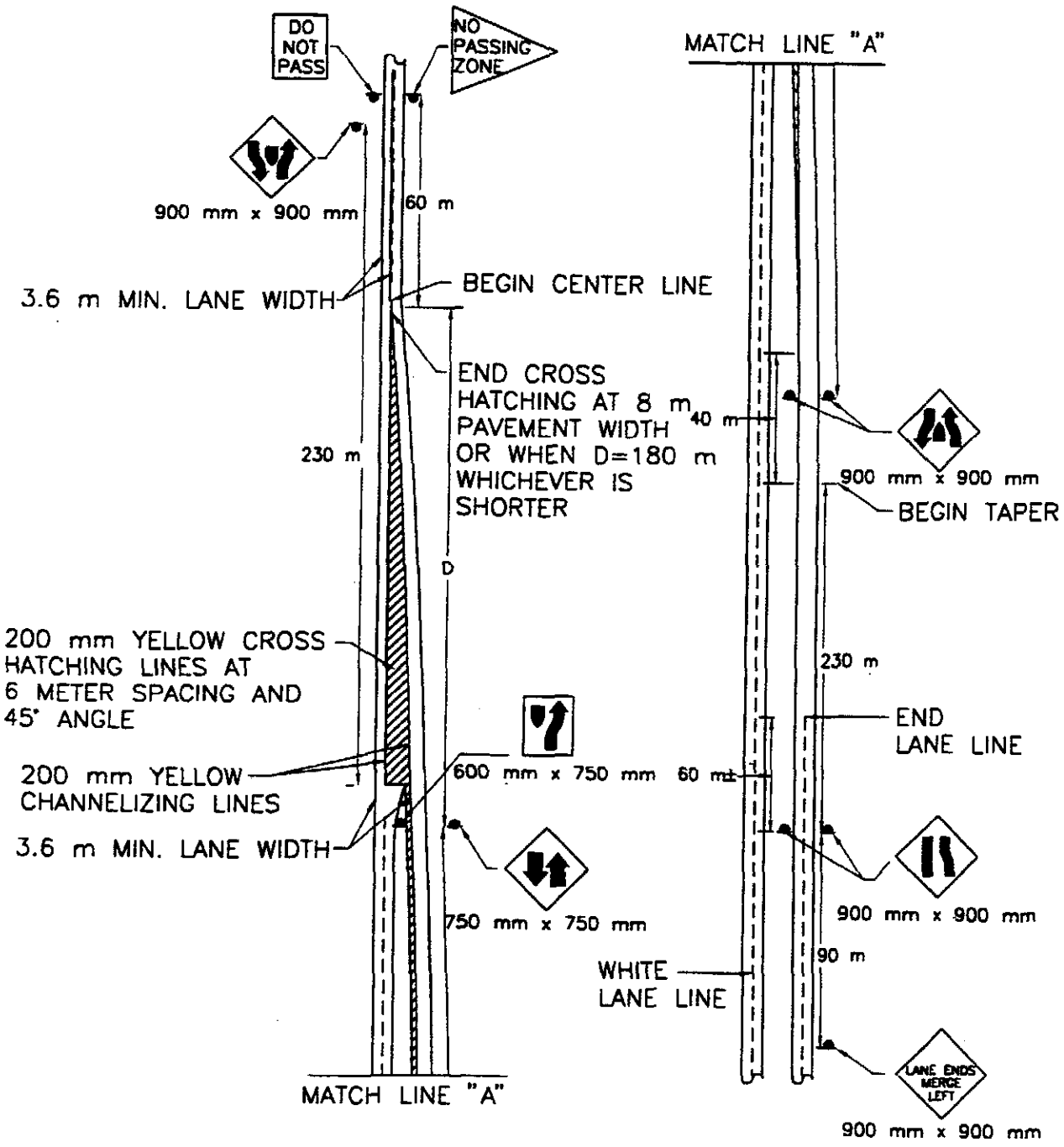
NOT TO SCALE

NOTE: SEE DRAWING TR.6.1 FOR PAVEMENT MARKINGS TABLE.

▷ ONE-WAY WHITE RPM
▶ ONE-WAY YELLOW RPM
◆ TWO-WAY YELLOW RPM

DATE OF ISSUE 5/13/95

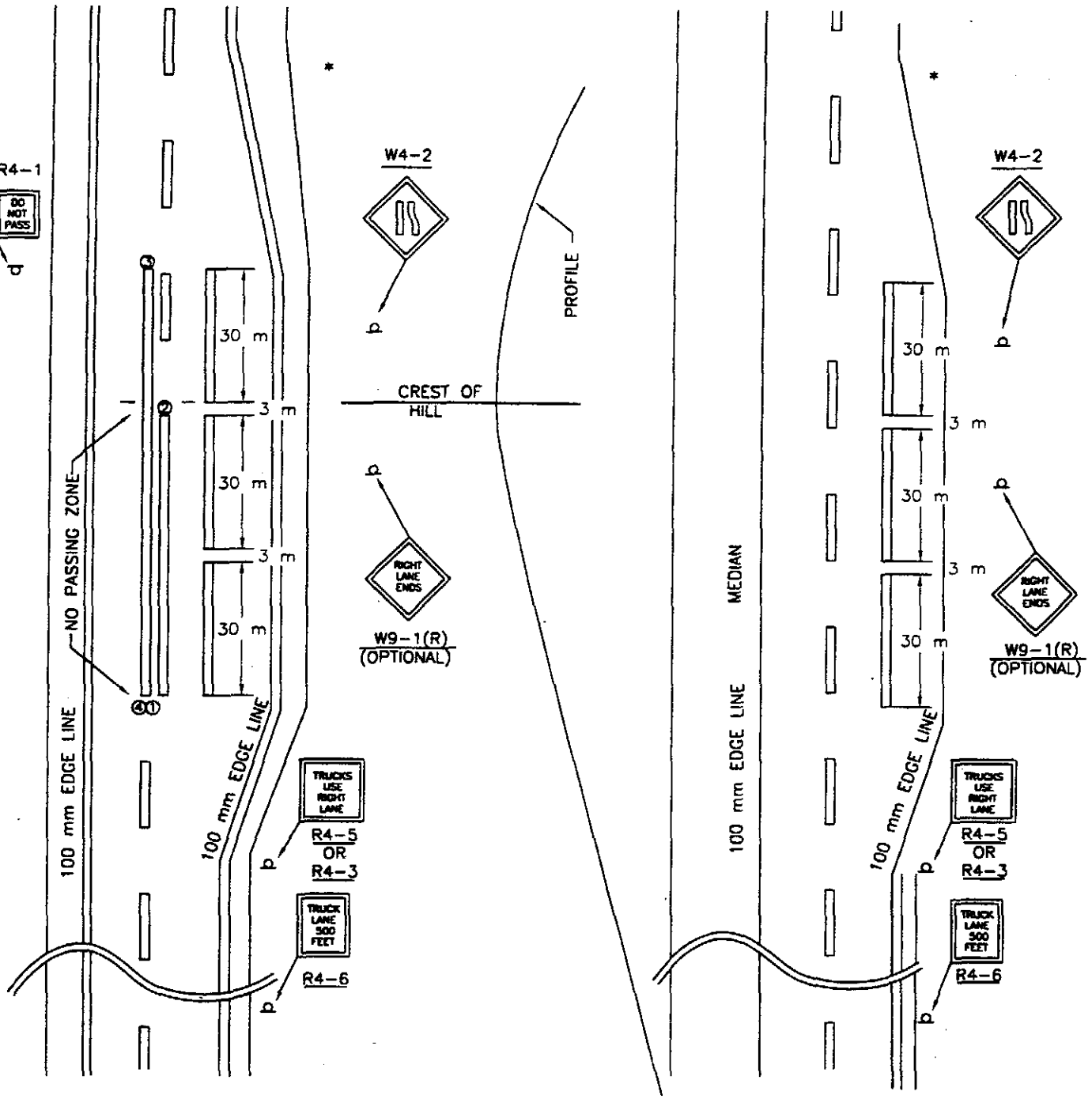
DRAWING NUMBER **TR.6.5**



NOTE: SEE DRAWING TR.6.1 FOR PAVEMENT MARKINGS TABLE.

MASS HIGHWAY SIGNS & SUPPORTS	PAVEMENT MARKINGS AND SIGNING FOR TRANSITION FROM 4 LANES DIVIDED TO 2 LANES	DATE OF ISSUE 5/13/95
		DRAWING NUMBER TR.6.6

* TAPER AS PER MHD
HIGHWAY DESIGN MANUAL



1 & 3 BEGINNING OF NO-PASSING ZONE.
2 & 4 END OF NO-PASSING ZONE.
2 & 3 BASED ON LIMITED SITE DISTANCE.
1 & 4 OPPOSITE BEGINNING OF CLIMBING LANE.

MASS HIGHWAY
SIGNS & SUPPORTS

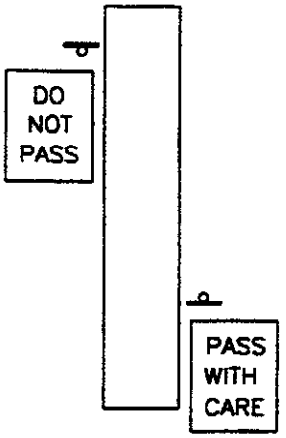
PAVEMENT MARKINGS AND SIGNING FOR CLIMBING LANES

DATE OF ISSUE 5/13/95

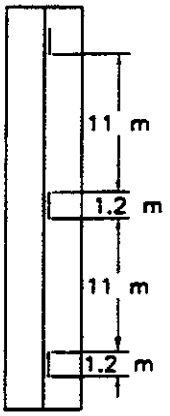
DRAWING NUMBER **TR.6.7**

UNDIVIDED 2 OR 3 LANE HIGHWAY

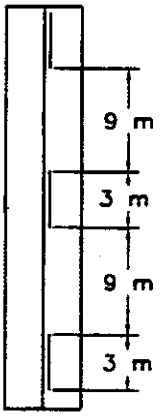
3 DAYS * OR LESS



14 DAYS OR LESS



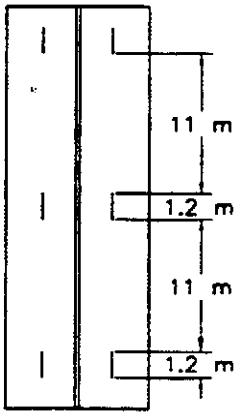
MORE THAN 14 DAYS



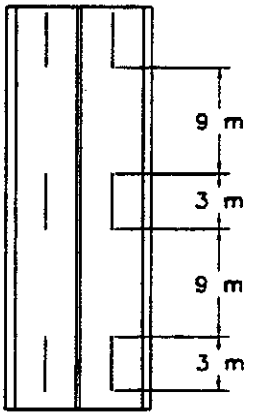
* MAY BE LONGER FOR LOW VOLUME ROADS.

UNDIVIDED MULTI-LANE HIGHWAY

14 DAYS OR LESS

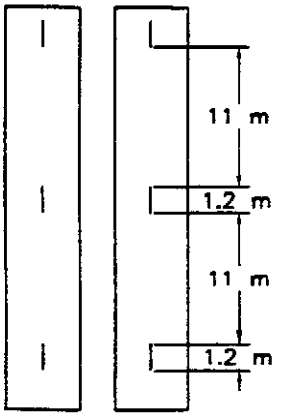


MORE THAN 14 DAYS

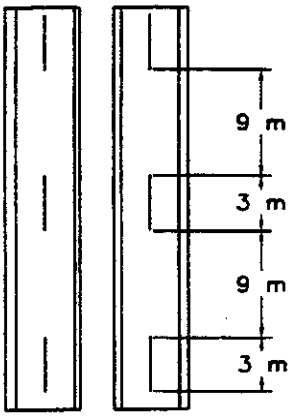


DIVIDED MULTI-LANE HIGHWAYS

14 DAYS OR LESS



MORE THAN 14 DAYS



NOTES

1) LOW VOLUME HIGHWAYS SHOULD BE DEFINED IN ACCORDANCE WITH STATEWIDE POLICY AS APPROVED BY THE FHWA DIVISION OFFICE. IT IS RECOMMENDED THAT UP TO 400-500 ADT BE CONSIDERED A LOW VOLUME ROAD.
2) SIGNS MAY BE USED INSTEAD OF PAVEMENT MARKINGS ON LOW VOLUME ROADS FOR UP TO 2 WEEKS, AFTER WHICH PERMANENT MARKINGS ARE REQUIRED.
3) ON OTHER THAN LOW VOLUME ROADS TEMPORARY OR PERMANENT MARKINGS SHALL BE IN PLACE BEFORE ROAD IS OPENED TO TRAFFIC.
4) EDGELINES ARE REQUIRED AFTER 14 DAYS ON ALL INTERSTATE AND RURAL MULTI-LANE HIGHWAYS, AND ON OTHER HIGHWAYS WHEN STATE POLICY CALLS FOR EDGELINES.
5) FOR MORE INFORMATION SEE CURRENT MUTCD.

MASS HIGHWAY
SIGNS & SUPPORTS

TEMPORARY PAVEMENT MARKINGS IN WORK ZONES

DATE OF ISSUE 5/13/95

DRAWING NUMBER **TR.6.8**

ITEM #	DESCRIPTION
859. --	REFLECTORIZED DRUM
859.1--	REFLECTORIZED DRUM WITH FLASHER (TYPE A) – Used to continually warn drivers that they are approaching or proceeding in a hazardous area (see current MUTCD)
859.2--	REFLECTORIZED DRUM WITH LIGHT (TYPE C) – Steady burn device used to delineate the edge of the traveled way on lane closures, detour curves, lane changes and other similar conditions (see current MUTCD).

NOTES:

1. DRUM DESIGN AND APPLICATION SHALL BE AS PER THE CURRENT EDITION OF THE MUTCD.

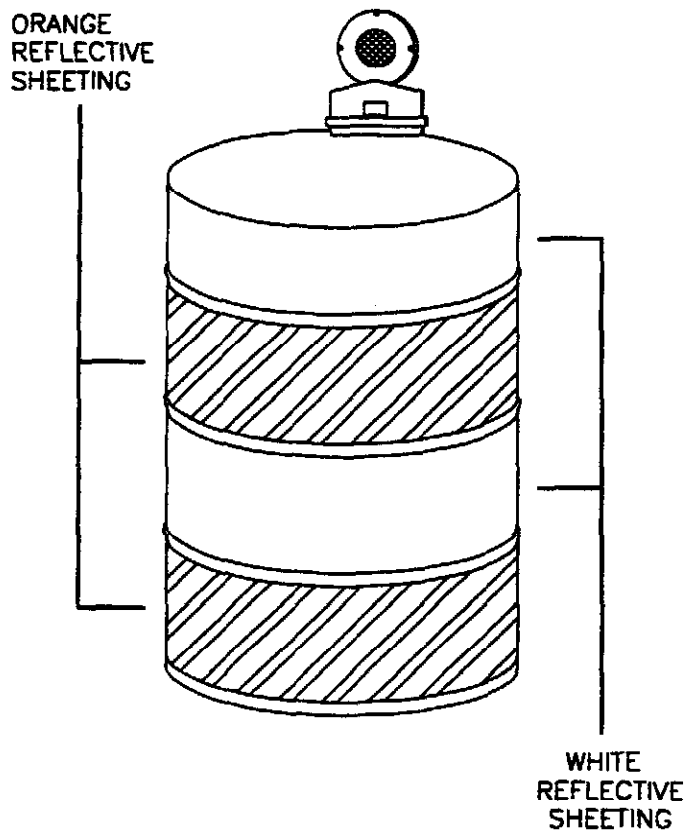
2. DRUMS SHALL BE APPROXIMATELY 1 METER IN HEIGHT, HAVING A MINIMUM WALL THICKNESS OF 2.3 MILLIMETERS AND A MINIMUM DIAMETER OF 450 MILLIMETERS REGARDLESS OF ORIENTATION.

3. DRUM MATERIAL MUST BE APPROVED U.V. RESISTANT, LOW DENSITY, IMPACT RESISTANT LINEAR POLYETHYLENE (OR APPROVED EQUIVALENT). METAL DRUMS ARE PROHIBITED FROM USE ON ALL STATE HIGHWAY PROJECTS.

4. SHEETING SHALL BE APPROVED ORANGE AND WHITE TYPE VI REFLECTORIZED SHEETING CONFORMING TO M.9.30.0.

5. ALL DRUMS SHALL BE WELL MAINTAINED INCLUDING REMOVAL OF DUST OR ROAD FILM, SO AS TO NOT REDUCE REFLECTIVE EFFICIENCY, WHEN A DRUM LOSES TARGET VALUE IT SHALL BE REPLACED.

6. WHEN A DRUM IS NO LONGER NEEDED IT SHALL BE STORED IN A DRUM STORAGE AREA, UNLESS IT IS REQUIRED FOR FUTURE USE WITHIN A FIVE DAY PERIOD, IN WHICH CASE IT MAY BE STORED ON LOCATION.



MASS HIGHWAY
SIGNS & SUPPORTS

PLASTIC DRUMS

DATE OF ISSUE
5/13/95

DRAWING NUMBER
TR.7.1