Land Transport Authority

251 North Bridge Road Singapore 179102
Tel: 1800-Call LTA (1800-2255582) Fax: (65) 3328223

Please Quote Our Reference
Number In Your Reply

18 February 2002

Our Ref: RT/GEN/GUIDE
Your Ref:

DID: 332 8219

See Distribution List

Dear Sir

REVISION TO STANDARD DETAIL OF ROAD ELEMENTS

1 We have recently made some revisions to the drawings in the "Standard Detail of Road Elements" handbook.

2 A list of the revised drawings is attached in Annex A for your easy reference. Please note that with effect from 1st March 2002, all new street plan submissions are required to comply with the above revisions.

3 I would appreciate it if you could inform your members about this circular. Thank you.

Yours faithfully

Quek Teck Beng
for Manager
Development & Building Control Department

1. President
Singapore Institute of Architects
79 Neil Road
Singapore 088904

2. President
Association of Consulting Engineers, Singapore
52 Anson Road #02-65
Anson Centre
Singapore 079904

3. President
Institute of Engineers, Singapore
70 Bukit Tinggi Road
Singapore 289758

4. President
Real Estate Developers' Association of Singapore
190 Clemenceau Avenue #07-01
Singapore Shopping Centre
Singapore 239924

5. President
Singapore Contractors Association Pte Ltd
1 Bukit Merah Lane 2
Singapore 159760

6. Chief Executive Officer
Building and Construction Authority
5 Maxwell Road #16-00
Tower Block, MND Complex
Singapore 069110

7. Chief Civil Engineer
Housing & Development Board
3451 Jalan Bukit Merah
Singapore 159459

8. Chief Executive Officer
Urban Redevelopment Authority
45 Maxwell Road
URA Centre
Singapore 760934

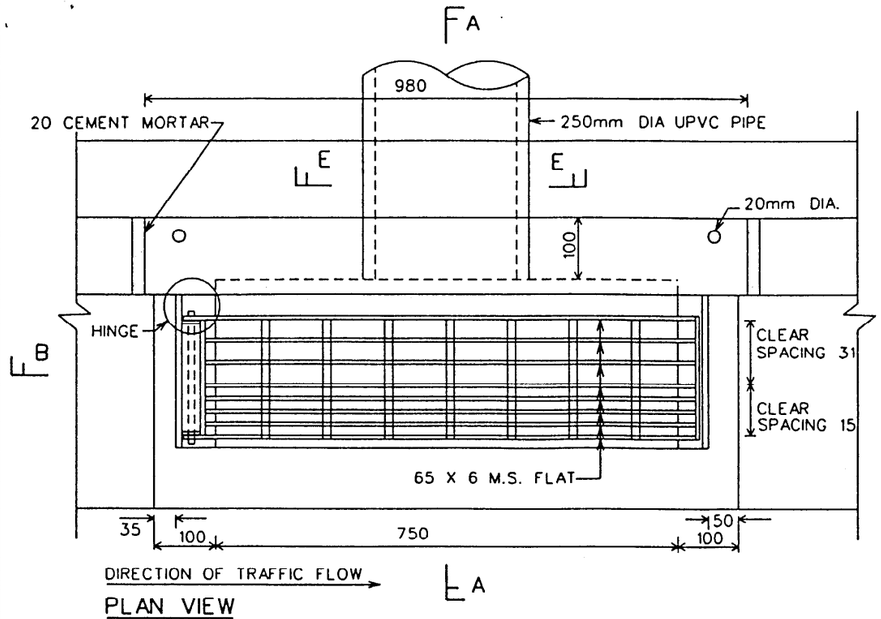
9. Chief Executive Officer
JTC Corporation
The JTC Summit
8 Jurong Town Hall
Singapore 609434

10. Head
Drainage Department
40 Scotts Road
#14-00 Environment Building
Singapore 228231

11. Chief Executive Officer
PWD Corporation Pte Ltd
238B Thomson Road #18-00
Tower B, Novena Square
Singapore 307685

ANNEX A

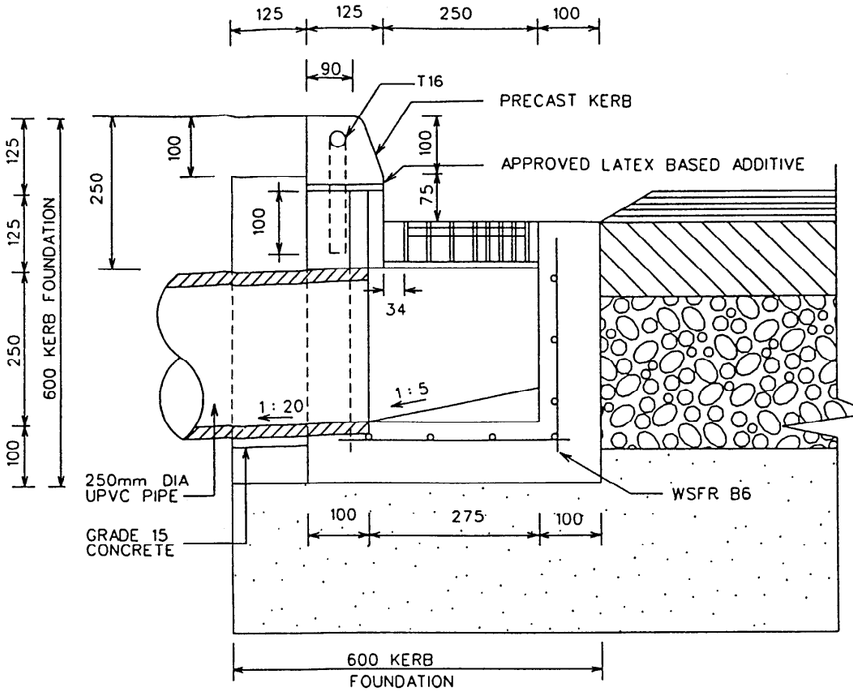
Drawing No	Changes	Remarks
LTA/RD/SD99/ DRA / 7A	To incorporate kerb opening in the drop-inlet chamber.	Requested by PUB (Drainage)
LTA/RD/SD99/ RAL/1B & 2B	Top rail of C & D to be continued between 2 posts. Notes 6 to 10 on powder coating amended to the latest practice.	Post capping is introduced to ensure that the rail is not continued beyond post.
LTA/RD/SD99/ RMS/14	Bus Friendly Hump cum raised zebra crossing	Additional type of hump for buses plying on these routes.
LTA/RD/SD99/ TMM/5	Bus Friendly Road Hump	Same as above.
LTA/RD/SD99/ TFI/17	Additional informatory signs	Signs on curve alignment markers, object markers and kerb strip markers shown.
LTA/RD/SD99/ RMS/5A	Included vibraline for expressway off ramp	Gore treatment shown when there are no immediate hazards.
LTA/RD/SD99/ BUS/8A	Bay Bus Details – Changes to reflective sheeting.	Sheeting all round bollard changed to black arrow on fluorescent yellow wide angle prismatic reflective sheeting.
LTA/RD/SD99/ BUS/10A	Safety bollard indicated on the details of bus shelter	Use of steel safety bollards infront of bus shelter for the safety of commuters
LTA/RD/SD99/ BUS/11	Safety Bollard	Details of Bollard
LTA/RD/SD99/ BOL/6	Details of Spring Loaded post for narrow divider	For narrow divider (not more than 400mm wide)
LTA/RD/SD99/ BOL/1 ,2 & 3 (drwg. not attached)	Fibre Glass Bollard –to be deleted	Replaced by Road Traffic Signs LTA/RD/SD99/TFM/2



PLAN VIEW

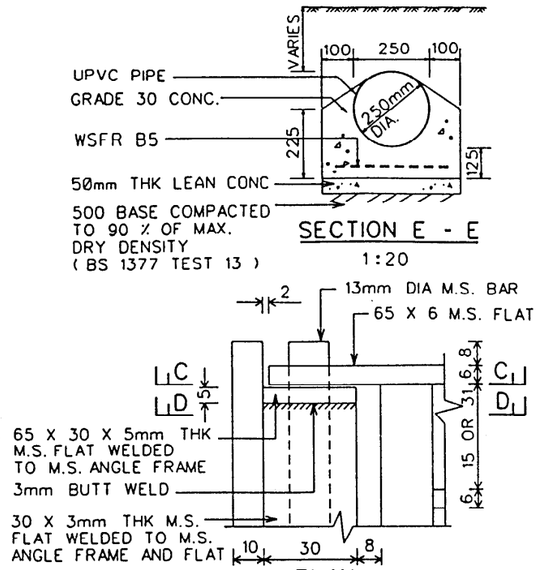
PRECAST CONCRETE DROP INLET CHAMBER (OUTER EDGE)

1 : 10



SECTION A-A

1 : 10



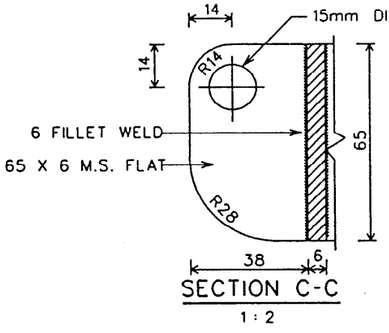
SECTION E - E

1 : 20

PLAN

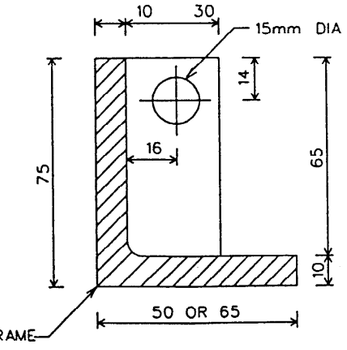
DETAIL OF HINGE

1 : 2



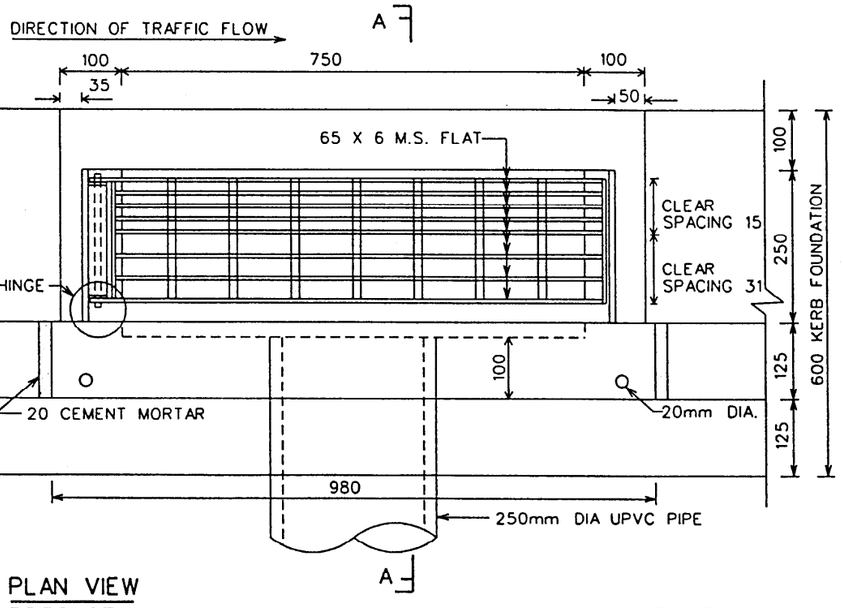
SECTION C-C

1 : 2



SECTION D-D

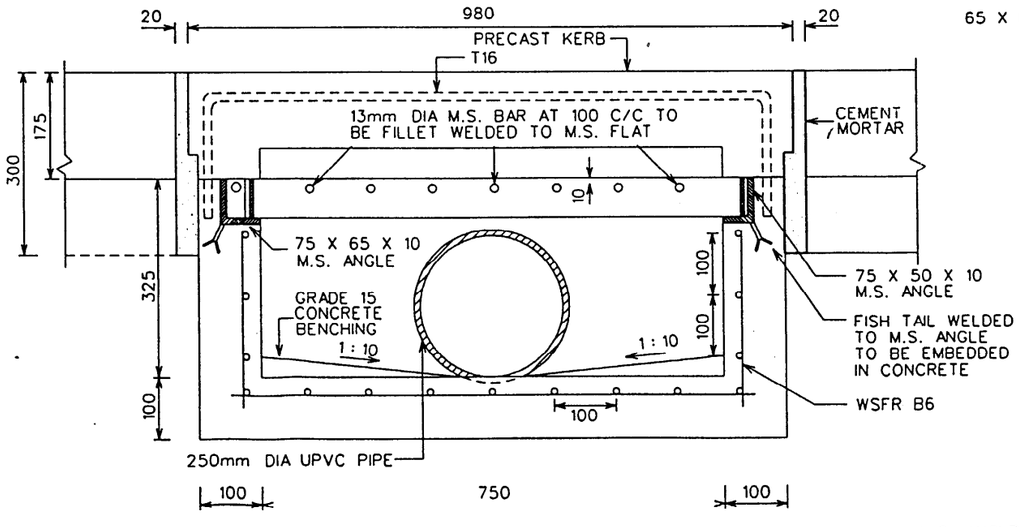
1 : 2



PLAN VIEW

PRECAST CONCRETE DROP INLET CHAMBER (INNER EDGE)

1 : 10



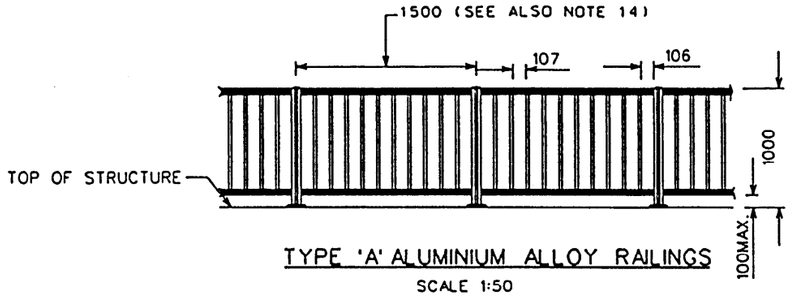
SECTION B-B

1 : 10

NOTES:-

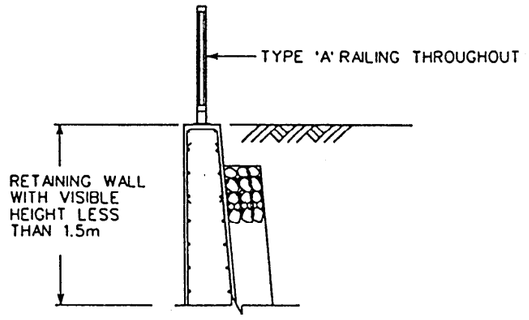
1. GRATINGS AND FRAMES ARE TO BE GALVANISED BY HOT- DIP GALVANISING PROCESS IN ACCORDANCE WITH SS117.
2. THE COMPLETE ASSEMBLY EXCEPT FISH TAIL ARE TO BE GALVANISED BY HOT-DIP GALVANISING PROCESS IN ACCORDANCE WITH S.S.117.
3. FISH TAIL IS TO BE WELDED TO M.S. ANGLE AND PLACED AT ALL CORNERS OF THE FRAME. ALL FLATS AND ANGLES ARE TO BE FILLET WELDED THROUGHOUT UNLESS OTHERWISE STATED.
4. THE HINGE MUST BE LOCATED SUCH THAT GRATING WILL BE CLOSED IN THE DIRECTION OF TRAFFIC FLOW.
5. 250mm DIA UPVC PIPE (OUTSIDE DIAMETER) SHALL CONFORM TO SS272 WITH NO. JOINTING (MIN. WALL THICKNESS 6.1mm).

DATE OF REVISION	STANDARD DETAIL	Land Transport Authority
A. 23-12-2001	PC.C. DROP-INLET CHAMBER	DRAWING NO. LTA/RD/SD99/DRA/7A
		DATE OF ISSUE: APR 2000 | SCALE: AS SHOWN | SHEET NO.: 1 OF 1



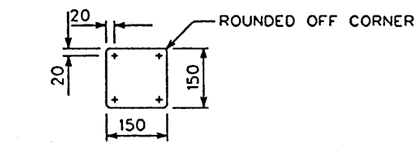
TYPE 'A' ALUMINIUM ALLOY RAILINGS

SCALE 1:50



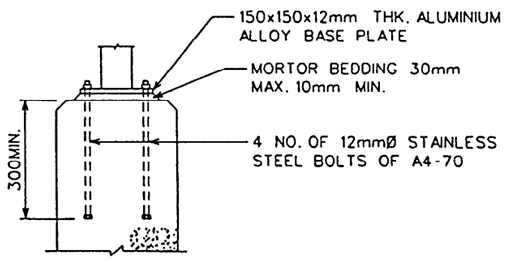
ILLUSTATION OF TYPE 'A' RAILINGS ON RETAINING WALL

SCALE 1:50



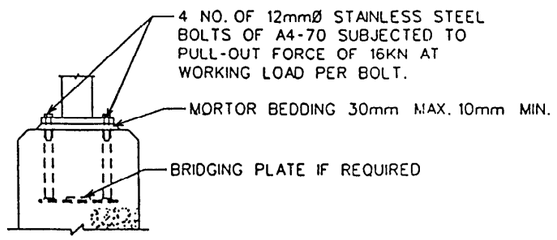
DETAILS OF BASE PLATE

SCALE 1:15



TYPICAL DETAILS OF RAILING FIXING TO CONCRETE STRUCTURE BY INDIVIDUAL ANCHORAGE FIXINGS

SCALE 1:15



TYPICAL DETAILS OF RAILING FIXING TO CONCRETE STRUCTURE BY CAST-IN CRADLES

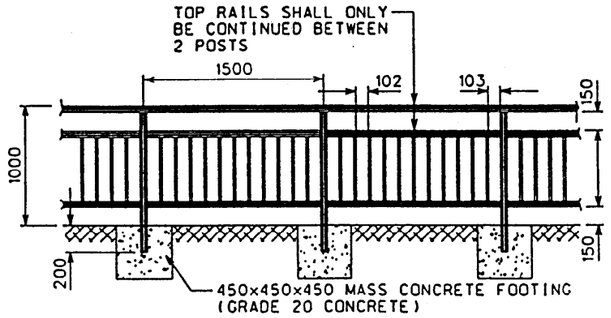
NOTE : CAST-IN CRADLES MAY BE USED AS AN ALTERNATIVE WHEN THE EMBEDED DEPTH IS NOT AVAILABLE

SCALE 1:15

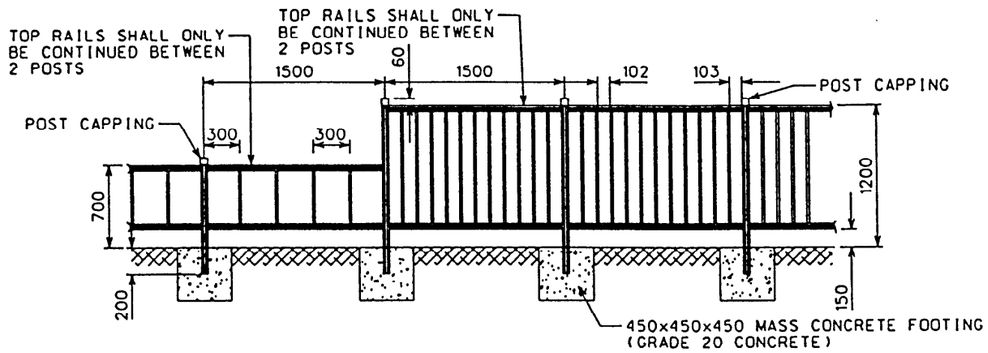
NOTES

1. ALL ALUMINIUM ALLOY RAILINGS SHALL BE DESIGNED, MANUFACTURED AND INSTALLED TO THE REQUIREMENTS OF BS 8118, BS 7818, BS 1474, BS 1490, BS EN 515, BS EN ISO 3506 AND THE LTA TECHNICAL SPECIFICATION ON PEDESTRIAN ALUMINIUM ALLOY RAILWAYS AS APPROPIATE. IN CASE OF ANY DISCREPANCIES ON VARIATIONS AMONG THESE SPECIFICATIONS, LTA TECHNICAL SPECIFICATIONS SHALL GENERALLY TAKE PRECEDENCE. ONLY LTA APPROVED RAILING SYSTEM WHICH COMPLIES WITH THE ABOVE SPECIFICATIONS SHALL BE ACCEPTED.
2. ALL PEDESTRIAN ALUMINIUM ALLOY RAILINGS SYSTEMS SHALL BE WARRANTED AGAINST POWER COATING SYSTEMS FOR A MINIMUM PERIOD OF 10 YEARS, AND PERFORMANCE FOR A MINIMUM PERIOD OF 30 YEARS FROM THE COMPLETION OF THE WHOLE WORKS. DEFECTS OCCURING DURING THIS PERIOD ARE TO BE MADE GOOD BY THE CONTRACTOR.
3. THE PEDESTRIAN ALUMINIUM RAILINGS SYSTEM SHALL BE A MODULAR SYSTEM TO EASE INSTALLATION AND REPLACEMENT TO MINIMISE DISRUPTION TO PEDESTRIAN MOVEMENT AND TRAFFIC FLOW. SPLICES SHALL BE TOTALLY PRECLUDED.
4. THE LOADS ARE ACTING AT 1.1m ABOVE DATUM LEVEL FOR DESIGN PUPOSE IRRESPECTIVE OF THE ACTUAL HEIGHT OF THE SYSTEM. DESIGN LOADS FOR TYPE 'E' SHALL BE DESIGNED TO THE DESIGN LOADS OF CLASS 3 TO BS 7818.
5. THE PEDESTRIAN ALUMINIUM ALLOY RAILINGS SYSTEMS SHALL BE FABRICATED FROM HIGH STRENGTH, MARINE GRADE ALUMINIUM ALLOYS OF DURABILITY RATING B WITH A MINIMUN TENSILE STRENGTH OF 280 N/mm^2 (Mpa) AND PROOF STRENGTH OF 240 N/mm^2 (Mpa) TO BS 8118.
6. THE POWDER COATINGS SHALL BE IN FULL COMPLIANCE TO AAMA2604.98. EDITION OR ANY LATER VERSION. THE POWDER COATINGS COLOUR SHALL BE IN ACCORDANCE WITH RAL 6002 LEAF GREEN. GROSS LEVEL TO BE SEMI GLOSS. (65 ± 5)%.
7. THE COATING THICKNESS FOR SINGLE COAT SYSTEM SHALL BE BETWEEN 60 TO 100 MICRONS AND MUST BE OF SUPERDURABLE POLYESTER GRADE. TWO-COAT SYSTEMS SHALL BE CONSIDERED FOR HIGH CORROSIVE AREAS SUCH AS COASTAL AREAS. COASTAL AREAS SHALL BE TAKEN AS $^1/_2$ KM FROM THE COAST. THE COATING THICKNESS FOR TWO-COAT SYSTEMS SHALL BE BETWEEN 120 TO 150 MICRONS.
8. ONLY PREVIOUSLY TESTED COATING WHICH FULLY COMPLIES WITH AAMA2604.98. QUV "A" AND QUV "B" TESTING OR EQUIVALENT SHALL BE SUBMITTED. THE APPROVED SAMPLE FOR EACH CONTRACT SHALL BE SENT TO SINGAPORE PRODUCTIVITY AND STANDARD BOARD (PSB) AND/OR ITS SUBSEQUENT TESTING ENTITIES FOR A FULL AAMA2604.98. QUV "A" AND QUV "B" TESTING IMMEDIATELY AFTER AWARD OF CONTRACT. QUV "A" TO HAVE AT LEAST 90% GLOSS RETENTION AND QUV "B" TO HAVE AT LEAST 80% RETENTION TO PROVIDE THAT COATING WHICH HAS BEEN DESIGNED, MANUFACTURED AND TESTED IN ACCORDANCE TO THE REQUIREMENTS OF THE DRAWINGS AND/OR THE MATERIAL SPECIFICATIONS SHALL NOT RELIEVE THE CONTRACTOR OF ANY PART OF THE RESPONSIBILITY FOR THIS SINGLE COLOUR. PSB CERTIFICATES WILL THEREINAFTER INDICATE AS COMPLYING TO LTA REQUIREMENTS. THE ACCEPTANCE THE CONTRACT.
9. SUPERDURABLE POWDER MUST BE APPLIED BY LISTED PSB/PLS CLASS 1A CATEGORY CONTRACTOR. THE POWDER APPLICATOR MUST BE APPROVED OR BE A LICENSED APPLICATOR OF THE POWDER MANUFACTURER AS THEY WILL BE JOINTLY AND SEVERALLY LIABLE FOR THE PERFORMANCE OF THE COATING.
10. APPROVED IDENTIFICATION PLATES SPECIFYING THE DATE OF THE INSTALLATION, COLOUR TYPE OF POWDER COATING USED AND THE TYPE OF RAILING SYSTEM USED SHALL BE INSTALLED ONTO THE RAILINGS. SUBJECT TO A MINIMUM OF 1 PLATE FOR EACH PROPOSED WORK JOB AND 1 PLATE PER EVERY 500m INTERVAL THEREAFTER.
11. THE PEDESTRIAN ALUMINIUM ALLOY RAILINGS SYSTEM SHALL BE RESISTANT TO VANDALISM. IT SHALL BE ENSURED THAT FIXINGS AND FASTENERS CANNOT BE LOOSENED SO AS TO ALLOW PARTS OF THE SYSTEM TO BE WILFULLY REMOVED, SIMPLY AND QUICKLY USING MINIMAL TOOLS OR TO BE DAMAGED FOR EXAMPLE BY BLOWS OR ACCIDENTAL HUMAN IMPACT. WHERE REQUIRED BY THE S.O. THE CONTRACTOR SHALL DEMONSTRATE ON TRIAL PANELS TO ACCESS AND ASCERTAIN THE PROVISION AGAINST THE VANDALISM.
12. STAINLESS STEEL HOLDING - DOWN BOLTS CONFORMING TO BS EN ISO 3506 OF A4-70 SHALL BE USED TO ANCHOR THE BASE PLATE OF THE ALUMINIUM POST TO THE CONCRETE SURFACE. ANCHORAGE IN CONCRETE SHALL BE EITHER CAST-IN CRADLE ANCHORAGE OR INDIVIDUAL ANCHORAGE SYSTEM.
ANCHOR BOLTS SHALL NOT BE SET WITHIN THE CONCRETE COVER. IN CASES WHERE ANCHOR BOLTS ARE TO BE SET INTO PLAIN ISOLATED CONCRETE FOOTING, THE MINIMUM EDGE DISTANCE FROM CONCRETE TO THE BOLTS AND BETWEEN ANCHOR BOLTS SHALL BE STRICTLY COMPILED WITH THE REQUIREMENTS SET BY THE RESPECTIVE MANUFACTURER FOR THE BOLTS CONCERNED.
13. THE POSTS AND VERTICAL BARS OF THE RAILINGS SHALL BE OF 75MM AND 25MM TUBULAR SECTIONS RESPECTIVELY, WITH MINIMUN OF 3MM THICKNESS
14. IF THE POSTS ARE REQUIRED TO BE SPACED WIDER THAN 1500MM. THE CONTRACTOR/MANUFACTURER SHALL REDESIGN THE ANCHORAGE, POSTS AND HORIZONTAL RAILS ETC. TO SUIT THE CONFIGURATION.

DATE OF REVISION	STANDARD DETAIL	Land Transport Authority
A. 11-09-2000 B. 16-11-2001	PEDESTRIAN ALUMINIUM ALLOY RAILINGS (TYPE A)	DRAWING NO. LTA/RD/SD99/RAL/1B
		DATE OF ISSUE: NOV 2001 | SCALE: AS SHOWN | SHEET NO.: 1 OF 2

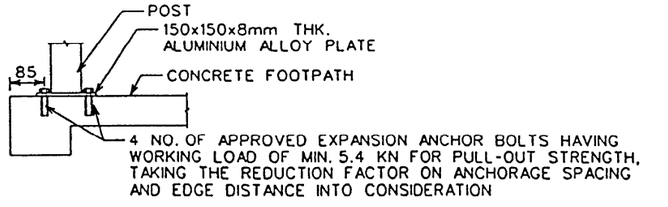


TYPE B ALUMINIUM ALLOY RAILINGS
SCALE 1:50

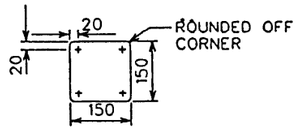


TYPE C ALUMINIUM ALLOY RAILINGS
SCALE 1:50

TYPE D ALUMINIUM ALLOY RAILINGS
SCALE 1:50



ANCHORAGE DETAILS OF POST TO FOOTPATH
SCALE 1:15

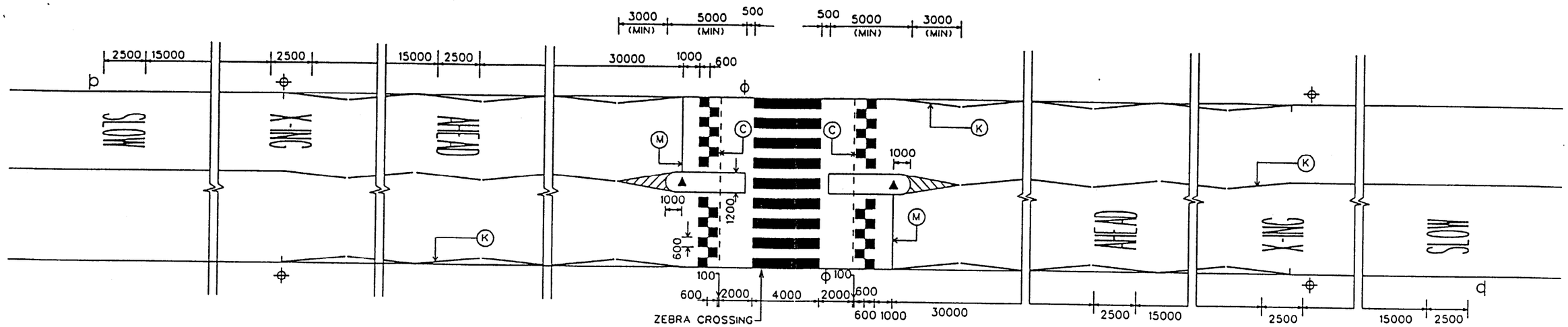


DETAILS OF BASE PLATE
SCALE 1:15

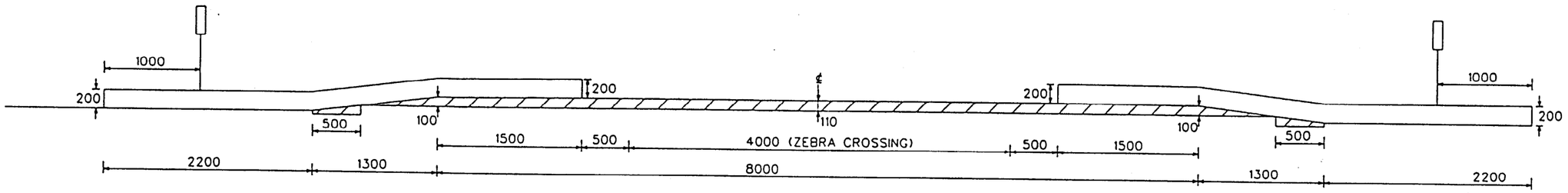
NOTES

1. ALL ALUMINIUM ALLOY RAILINGS SHALL BE DESIGNED, MANUFACTURED AND INSTALLED TO THE REQUIREMENTS OF BS 8118, BS 7818, BS 1474, BS 1490, BS EN 515, BS EN ISO 3506 AND THE LTA TECHNICAL SPECIFICATION ON PEDESTRIAN ALUMINIUM ALLOY RAILWAYS AS APPROPIATE. IN CASE OF ANY DISCREPANCIES ON VARIATIONS AMONG THESE SPECIFICATIONS. LTA TECHNICAL SPECIFICATIONS SHALL GENERALLY TAKE PRECEDENCE. ONLY LTA APPROVED RAILING SYSTEM WHICH COMPLIES WITH THE ABOVE SPECIFICATIONS SHALL BE ACCEPTED.
2. ALL PEDESTRIAN ALUMINIUM ALLOY RAILINGS SYSTEMS SHALL BE WARRANTED AGAINST POWER COATING SYSTEMS FOR A MINIMUM PERIOD OF 10 YEARS. AND PERFORMANCE FOR A MINIMUM PERIOD OF 30 YEARS FROM THE COMPLETION OF THE WHOLE WORKS. DEFECTS OCCURING DURING THIS PERIOD ARE TO BE MADE GOOD BY THE CONTRACTOR.
3. THE PEDESTRIAN ALUMINIUM RAILINGS SYSTEM SHALL BE A MODULAR SYSTEM TO EASE INSTALLATION AND REPLACEMENT TO MINIMISE DISRUPTION TO PEDESTRIAN MOVEMENT AND TRAFFIC FLOW. SPLICES SHALL BE TOTALLY PRECLUDED.
4. THE LOADS ARE ACTING AT 1.1m ABOVE DATUM LEVEL FOR DESIGN PUPOSE IRRESPECTIVE OF THE ACTUAL HEIGHT OF THE SYSTEM. DESIGN LOADS FOR TYPE 'B', 'C' & 'D' SHALL BE DESIGNED TO THE DESIGN LOADS OF CLASS 1 TO BS 7818.
5. THE PEDESTRIAN ALUMINIUM ALLOY RAILINGS SYSTEMS SHALL BE FABRICATED FROM HIGH STRENGTH, MARINE GRADE ALUMINIUM ALLOYS OF DURABILITY RATING B WITH A MINIMUN TENSILE STRENGTH OF 280 N/mm^2 (Mpa) AND PROOF STRENGTH OF 240 N/mm^2 (Mpa) TO BS 8118.
6. THE POWDER COATINGS SHALL BE IN FULL COMPLIANCE TO AAMA2604.98. EDITION OR ANY LATER VERSION. THE POWDER COATINGS COLOUR SHALL BE IN ACCORDANCE WITH RAL 6002 LEAF GREEN. GROSS LEVEL TO BE SEMI GLOSS. (65 ± 5)%.
7. THE COATING THICKNESS FOR SINGLE COAT SYSTEM SHALL BE BETWEEN 60 TO 100 MICRONS AND MUST BE OF SUPERDURABLE POLYESTER GRADE. TWO-COAT SYSTEMS SHALL BE CONSIDERED FOR HIGH CORROSIVE AREAS SUCH AS COASTAL AREAS. COASTAL AREAS SHALL BE TAKEN AS $^1/_2$ KM FROM THE COAST. THE COATING THICKNESS FOR TWO-COAT SYSTEMS SHALL BE BETWEEN 120 TO 150 MICRONS.
8. ONLY PREVIOUSLY TESTED COATING WHICH FULLY COMPLIES WITH AAMA2604.98. QUV "A" AND QUV "B" TESTING OR EQUIVALENT SHALL BE SUBMITTED. THE APPROVED SAMPLE FOR EACH CONTRACT SHALL BE SENT TO SINGAPORE PRODUCTIVITY AND STANDARD BOARD (PSB) AND/OR ITS SUBSEQUENT TESTING ENTITIES FOR A FULL AAMA2604.98. QUV "A" AND QUV "B" TESTING IMMEDIATELY AFTER AWARD OF CONTRACT. QUV "A" TO HAVE AT LEAST 90% GLOSS RETENTION AND QUV "B" TO HAVE AT LEAST 80% RETENTION TO PROVIDE THAT COATING WHICH HAS BEEN DESIGNED, MANUFACTURED AND TESTED IN ACCORDANCE TO THE REQUIREMENTS OF THE DRAWINGS AND/OR THE MATERIAL SPECIFICATIONS SHALL NOT RELIEVE THE CONTRACTOR OF ANY PART OF THE RESPONSIBILITY FOR THIS SINGLE COLOUR. PSB CERTIFICATES WILL THEREINAFTER INDICATE AS COMPLYING TO LTA REQUIREMENTS. THE ACCEPTANCE THE CONTRACT.
9. SUPERDURABLE POWDER MUST BE APPLIED BY LISTED PSB/PLS CLASS 1A CATEGORY CONTRACTOR. THE POWDER APPLICATOR MUST BE APPROVED OR BE A LICENSED APPLICATOR OF THE POWDER MANUFACTURER AS THEY WILL BE JOINTLY AND SEVERALLY LIABLE FOR THE PERFORMANCE OF THE COATING.
10. APPROVED IDENTIFICATION PLATES SPECIFYING THE DATE OF THE INSTALLATION, COLOUR TYPE OF POWDER COATING USED AND THE TYPE OF RAILING SYSTEM USED SHALL BE INSTALLED ONTO THE RAILINGS. SUBJECT TO A MINIMUM OF 1 PLATE FOR EACH PROPOSED WORK JOB AND 1 PLATE PER EVERY 500m INTERVAL THEREAFTER.
11. THE PEDESTRIAN ALUMINIUM ALLOY RAILINGS SYSTEM SHALL BE RESISTANT TO VANDALISM. IT SHALL BE ENSURED THAT FIXINGS AND FASTENERS CANNOT BE LOOSENED SO AS TO ALLOW PARTS OF THE SYSTEM TO BE WILFULLY REMOVED, SIMPLY AND QUICKLY USING MINIMAL TOOLS OR TO BE DAMAGED FOR EXAMPLE BY BLOWS OR ACCIDENTAL HUMAN IMPACT. WHERE REQUIRED BY THE S.O. THE CONTRACTOR SHALL DEMONSTRATE ON TRIAL PANELS TO ACCESS AND ASCERTAIN THE PROVISION AGAINST THE VANDALISM.
12. STAINLESS STEEL HOLDING - DOWN BOLTS CONFORMING TO BS EN ISO 3506 OF A4-70 SHALL BE USED TO ANCHOR THE BASE PLATE OF THE ALUMINIUM POST TO THE CONCRETE SURFACE. ANCHORAGE IN CONCRETE SHALL BE EITHER CAST-IN CRADLE ANCHORAGE OR INDIVIDUAL ANCHORAGE SYSTEM.
ANCHOR BOLTS SHALL NOT BE SET WITHIN THE CONCRETE COVER. IN CASES WHERE ANCHOR BOLTS ARE TO BE SET INTO PLAIN ISOLATED CONCRETE FOOTING. THE MINIMUM EDGE DISTANCE FROM CONCRETE TO THE BOLTS AND BETWEEN ANCHOR BOLTS SHALL BE STRICTLY COMPILED WITH THE REQUIREMENTS SET BY THE RESPECTIVE MANUFACTURER FOR THE BOLTS CONCERNED.
13. TYPE 'B' RAILINGS SHALL BE INSTALLED ALONG DRAIN.
14. TYPE 'C' RAILINGS SHALL BE INSTALLED ALONG CENTRAL DEVIDERS AND FOOTPATH ADJOINING CARRIAGEWAY THAT USUALLY LOCATED AT ROAD JUNCTIONS AND PEDESTRIAN CROSSING TO ENSURE THAT VISIBILITY AND LINE OF SIGNT FOR DRIVERS AND PEDESTRIANS ARE NOT IMPAIRED FOR ROAD SAFETY REASONS
15. TYPE 'D' RAILINGS SHALL BE INSTALLED ALONG CENTRAL DEVIDERS AND FOOTPATH ADJOINING CARRIAGEWAY.
16. THE POSTS AND VERTICAL BARS OF THE RAILINGS SHALL BE OF 54MM AND 20MM TUBULAR SECTIONS RESPECTIVELY.
17. EXPANSION ANCHOR BOLT USED SHALL BE APPROVED TO COMPLY WITH THE FOLLOWINGS:
    a. DRILL HOLE DIAMETER = 18mm
    b. MIN. DEPTH OF EMBEDMENT = 50mm

DATE OF REVISION	STANDARD DETAIL	Land Transport Authority
A. 11-09-2000 B. 16-11-2001	PEDESTRIAN ALUMINIUM ALLOY RAILINGS (TYPE B, C, D)	DRAWING NO. LTA/RD/SD99/RAL/2B
		DATE OF ISSUE: SEP 2000 | SCALE: AS SHOWN | SHEET NO.: 2 OF 2



LAYOUT DETAIL
1 : 250



LONGITUDINAL SECTION OF RAISED ZEBRA CROSSING AND CENTRE REFUGE ISLAND
1:50

LEGEND

- PROP 1.2m WIDE CENTRE REFUGE ISLAND WITH KERB PAINTING
- PROP RAISED ZEBRA CROSSING AHEAD SIGN
- PROP FLASHING BEACON
- PROP PEDESTRIAN CROSSING PROHIBITION SIGN
- PROP KEEP LEFT SIGN
- (C) PROP CHECKER MARKINGS TO BE PAINTED IN YELLOW
- (M) PROP STOP LINE
- (K) PROP ZIG-ZAG LINE
- PROP CHEVRON MARKINGS
- (AHEAD / X-ING / SLOW) PROP ROAD MARKINGS

NOTES:-

1. FOOTPATH JOINING PEDESTRIAN CROSSINGS SHOULD BE FLUSHED WITH ZEBRA CROSSING.
2. CENTER REFUGE ISLAND SHOULD TERMINATE NEAR A LAMP POLE.
3. FLOODLIGHT TO BE PROVIDE IF NECESSARY.

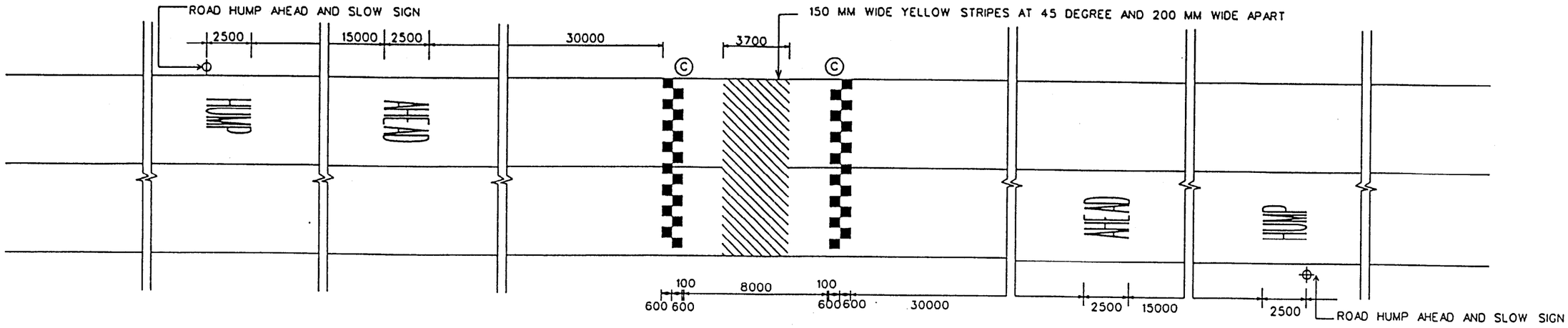
STANDARD DETAIL

BUS FRIENDLY HUMP CUM
RAISED ZEBRA CROSSING

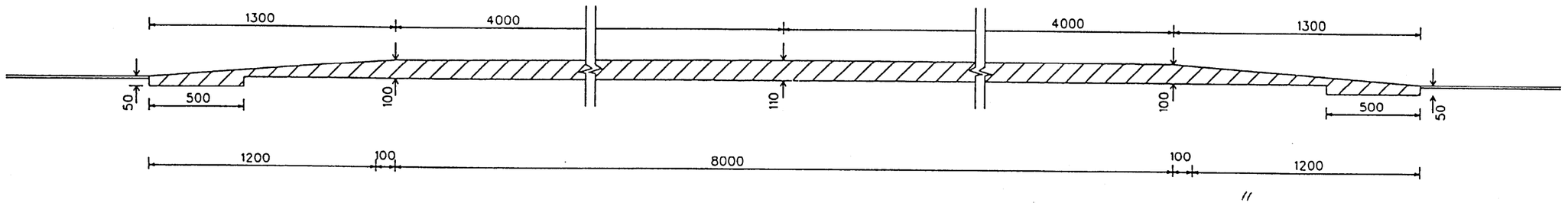
Land Transport Authority

DRAWING NO. LTA/RD/SD99/RMS/14

DATE OF ISSUE	SCALE	SHEET NO.
AUG '01	AS SHOWN	1 OF 1



LAYOUT DETAIL
1 : 250

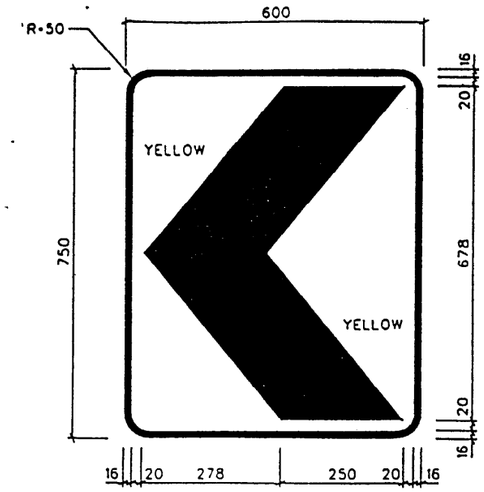


LONGITUDINAL SECTION OF BUS FRIENDLY HUMP
1:25

NOTE

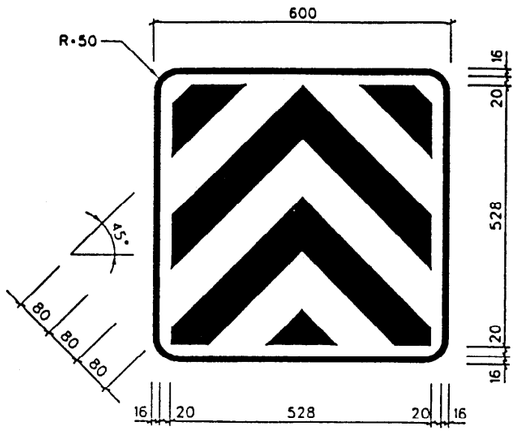
CHECKER MARKINGS (C) TO BE PAINTED IN YELLOW

	STANDARD DETAIL	Land Transport Authority
	BUS FRIENDLY ROAD HUMP	DRAWING NO. LTA/RD/SD99/TMM/5
		DATE OF ISSUE AUG '01 | SCALE AS SHOWN | SHEET NO. 1 OF 1



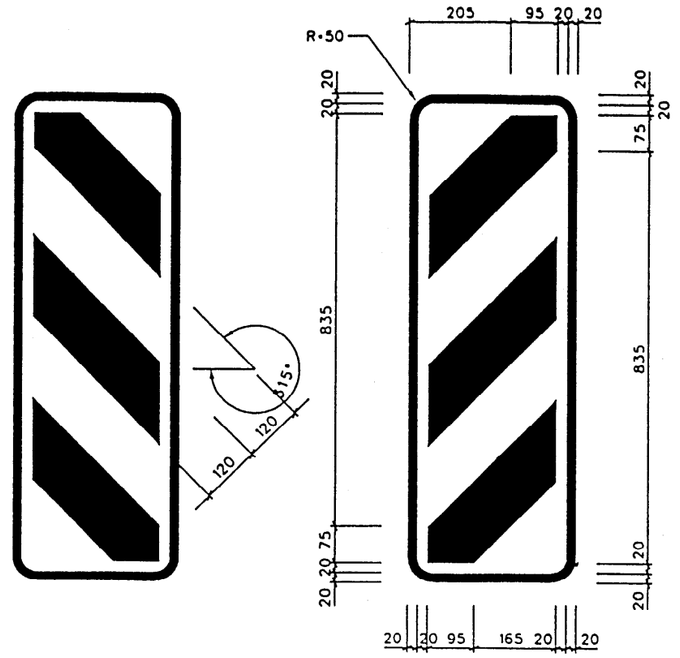
CURVE ALIGNMENT MARKER (for arterial road)

BLACK ARROW : VINYL CUT FILM
YELLOW BACKGROUND : FLOURESCENT YELLOW WIDE ANGLE
PRISMATIC REFLECTIVE SHEETING OR EQUIVALENT
BACKING : 2.03mm ALUMINIUM PLATE
SIZE : 600mm x 750mm
BORDER : 16mm BLACK ALL ROUND



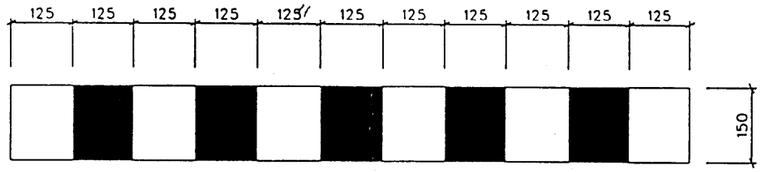
600mm x 600mm OBJECT MARKER

BLACK ARROW : VINYL CUT FILM
YELLOW BACKGROUND : FLOURESCENT YELLOW WIDE ANGLE
PRISMATIC REFLECTIVE SHEETING OR EQUIVALENT
BACKING : 2.03mm ALUMINIUM PLATE
SIZE : 600mm x 600mm
BORDER : 16mm BLACK ALL ROUND



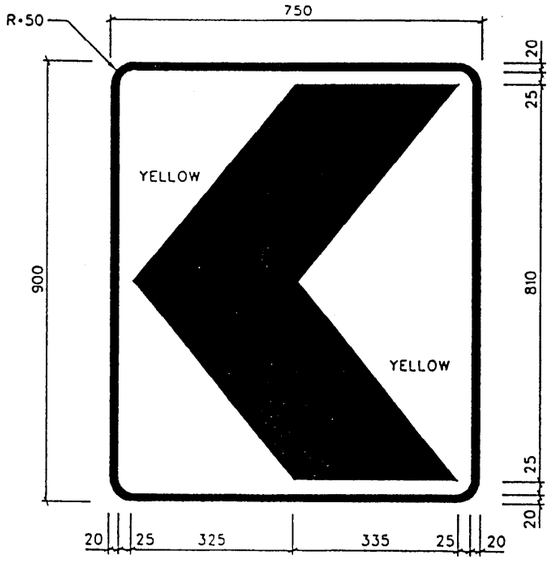
340mm x 990mm OBJECT MARKER

BLACK STRIP : VINYL CUT FILM
YELLOW BACKGROUND : FLOURESCENT YELLOW WIDE ANGLE
PRISMATIC REFLECTIVE SHEETING OR EQUIVALENT
BACKING : 2.03mm ALUMINIUM PLATE
SIZE : 340mm x 990mm
BORDER : 20mm BLACK ALL ROUND



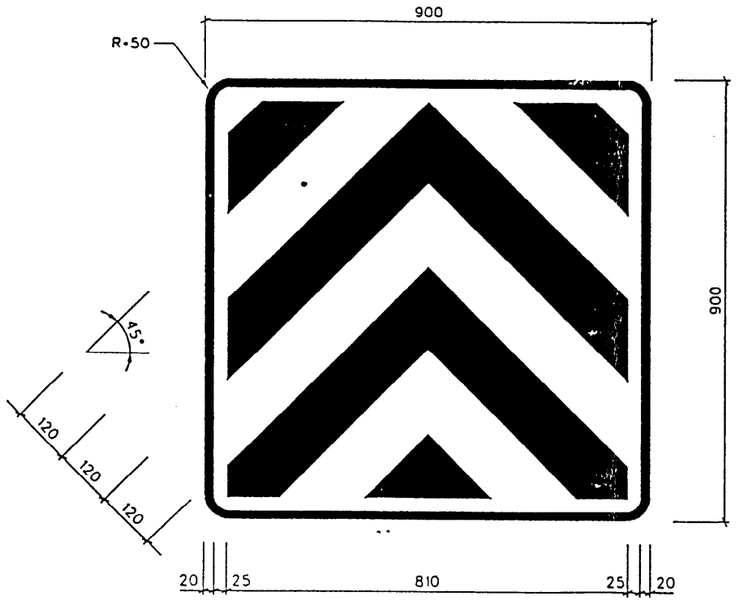
KERB STRIP MARKER

BLACK STRIP : VINYL CUT FILM
YELLOW BACKGROUND : FLOURESCENT YELLOW WIDE ANGLE
PRISMATIC REFLECTIVE SHEETING OR EQUIVALENT
BACKING : 2.03mm ALUMINIUM PLATE
HEIGHT : 150mm
LENGTH : VARIES WITH SIZE OF KERB NOSING



CURVE ALIGNMENT MARKER (for expressway)

BLACK ARROW : VINYL CUT FILM
YELLOW BACKGROUND : FLOURESCENT YELLOW WIDE ANGLE
PRISMATIC REFLECTIVE SHEETING OR EQUIVALENT
BACKING : 2.03mm ALUMINIUM PLATE
SIZE : 750mm x 900mm
BORDER : 20mm BLACK ALL ROUND



900mm x 900mm OBJECT MARKER

BLACK ARROW : VINYL CUT FILM
YELLOW BACKGROUND : FLOURESCENT YELLOW WIDE ANGLE
PRISMATIC REFLECTIVE SHEETING OR EQUIVALENT
BACKING : 2.03mm ALUMINIUM PLATE
SIZE : 900mm x 900mm
BORDER : 20mm BLACK ALL ROUND

STANDARD DETAIL

ROAD TRAFFIC SIGNS
& ASSOCIATED PLATES
(INFORMATORY SIGNS)

Land Transport Authority

DRAWING NO. LTA/RD/SD99/TFI/17

DATE OF ISSUE	SCALE	SHEET NO.
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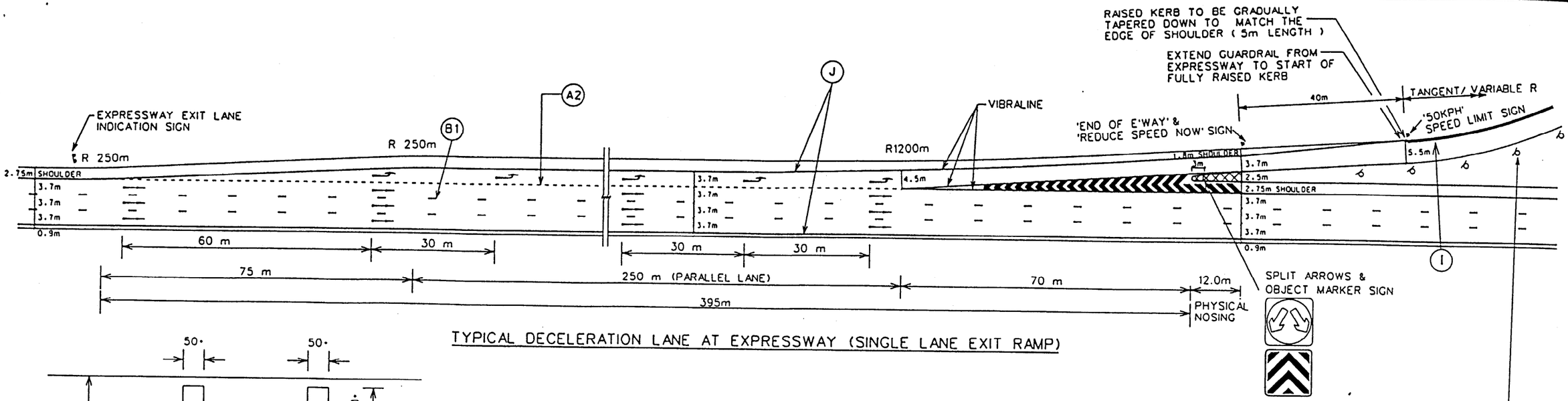
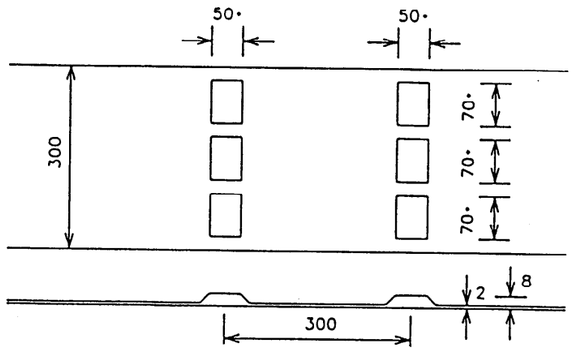


TYPICAL DECELERATION LANE AT EXPRESSWAY (SINGLE LANE EXIT RAMP)



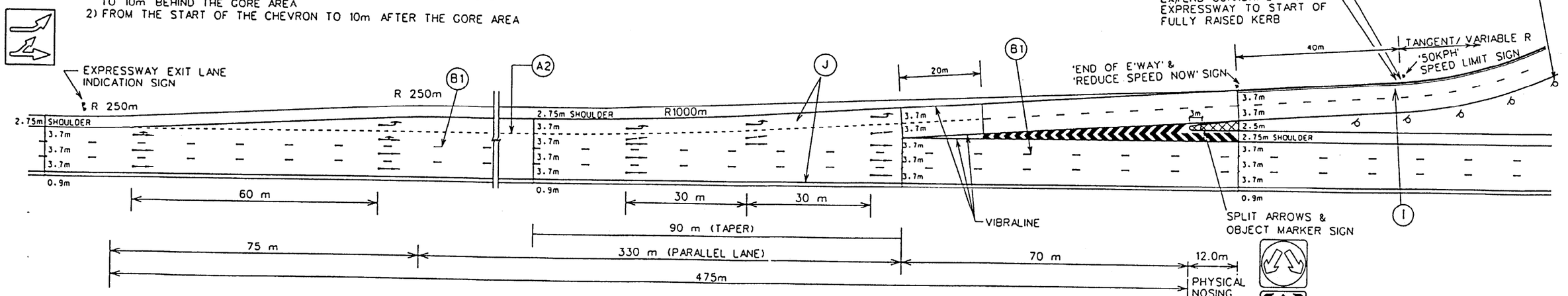
DETAILS OF VIBRALINE

VIBRALINE TO BE PROVIDED FROM THE FOLLOWING:
1) FROM THE START OF THE SHOULDER MARKING AT THE EXIT ROAD TO 10m BEHIND THE GORE AREA
2) FROM THE START OF THE CHEVRON TO 10m AFTER THE GORE AREA

RADIUS OF CURVE (IN METERS)	SPACING OF CURVE ALIGNMENT MARKERS (IN METERS)
45	9
60	11
75	12
90	15
120	17
150	20
180	21
210	23
240	24
270	26
300	27

DETAILS OF SPACING FOR CURVE ALIGNMENT MARKERS

750X900 CURVE ALIGNMENT MARKER USING FLUORESCENT YELLOW WIDE ANGLE PRISMATIC REFLECTIVE SHEETING OR EQUIVALENT ON 2.03mm ALUMINUM PLATE CURVE ALIGNMENT MARKER TO BE PROVIDED ALONG THE ENTIRE CURVE . HEIGHT OF THE CURVE ALIGNMENT SHALL NOT BE MORE THAN 2.2m FROM THE GROUND TO THE TOP OF THE MARKER (SEE TABLE FOR SPACING)



TYPICAL DECELERATION LANE AT EXPRESSWAY (TWO LANE EXIT RAMP)

NOTE:-
300mm WIDE SINGLE WHITE LINE ALONG ACCELERATION AND DECELERATION LANE WILL TERMINATE AT LOCATION WHERE 'END OF EXPRESSWAY' AND 'START OF EXPRESSWAY' SIGN IS ERECTED. DOUBLE PARALLEL CONTINUOUS LONGITUDINAL YELLOW LINES WILL CONTINUE FROM THIS LOCATION.

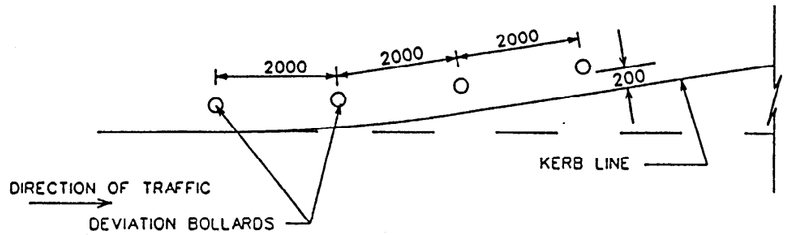
STANDARD DETAIL

CHEVRON MARKINGS FOR EXPRESSWAYS

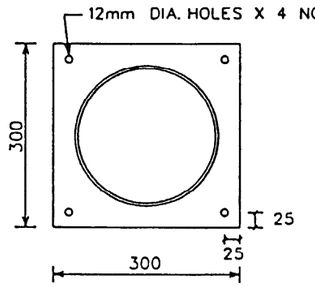
Land Transport Authority

DRAWING NO. LTA/RD/SD99/RMS/5A

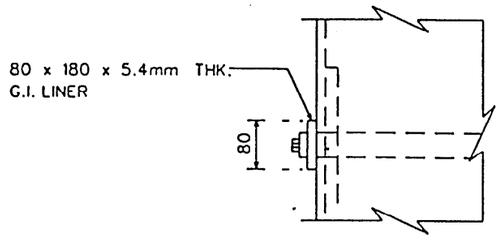
DATE OF ISSUE	SCALE	SHEET NO.
APR 2000	1:1000	2 of 3



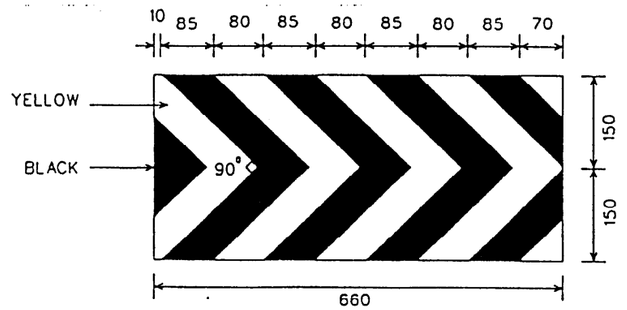
ARRANGEMENT OF DEVIATION BOLLARD
1 : 100



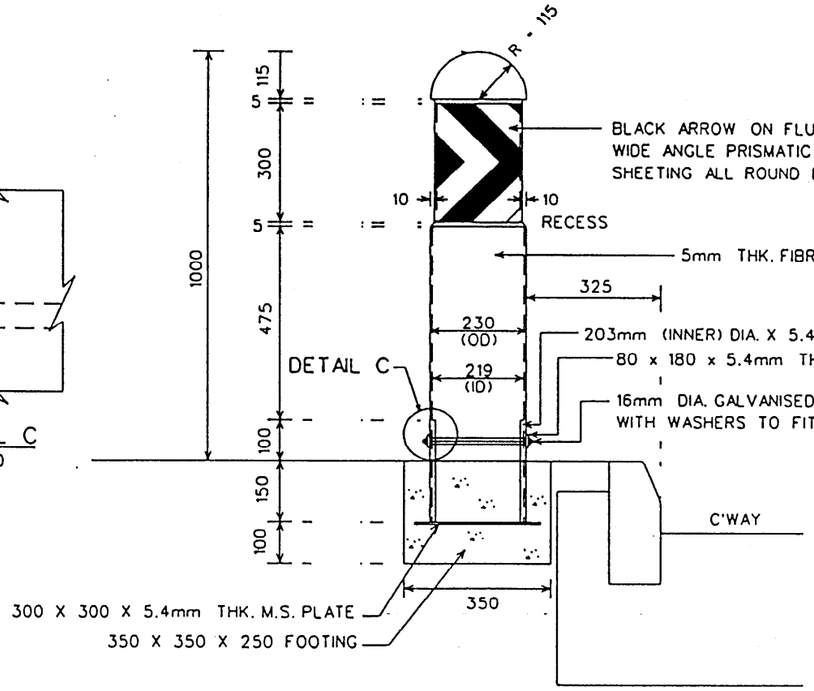
DETAIL D
1 : 10



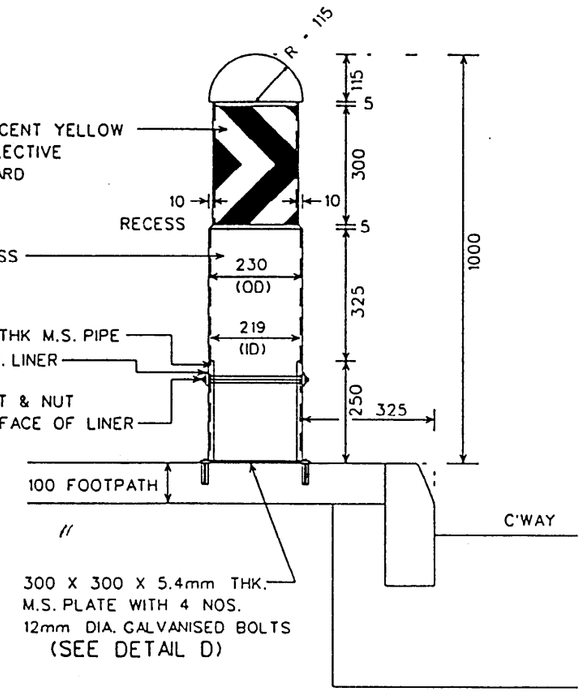
DETAIL C
1 : 10



DETAILS OF BAND ON BOLLARD
1 : 10



DEVIATION BOLLARD ON GRASS VERGE
1 : 10



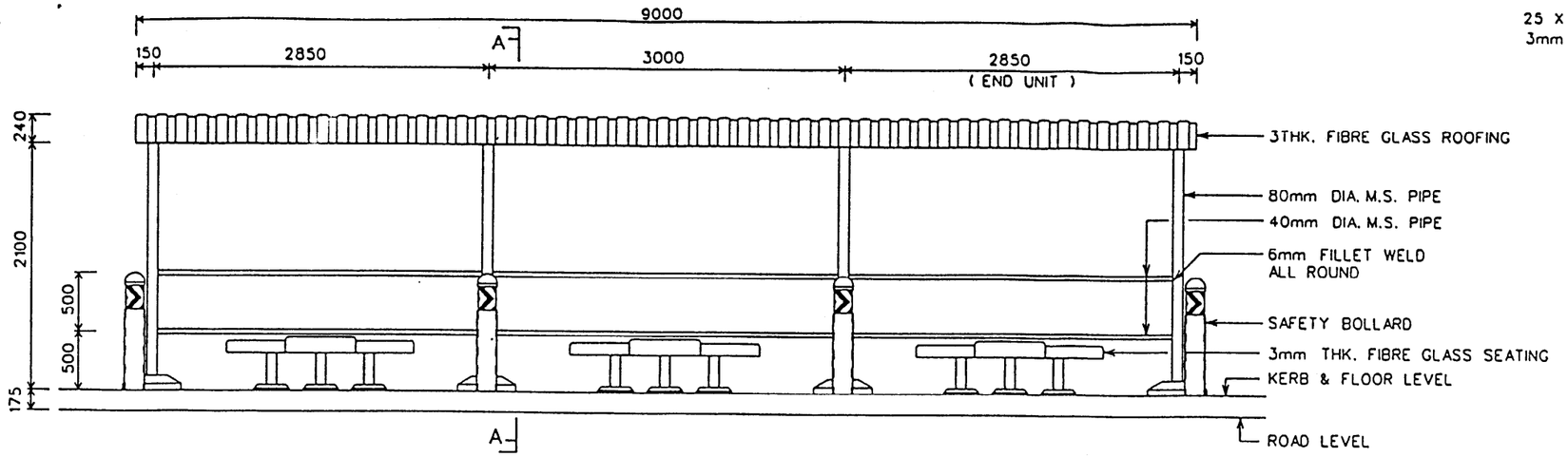
DEVIATION BOLLARD ON CONCRETE FOOTPATH
1 : 10

STANDARD DETAIL

BUS BAY DETAILS

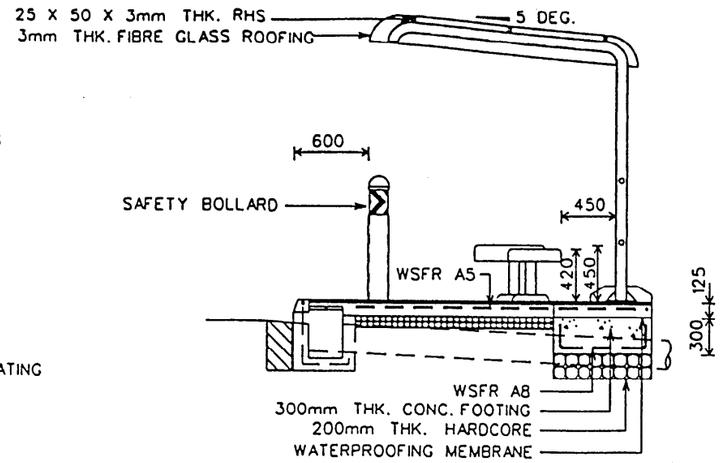
Land Transport Authority

DRAWING NO.		
LTA/RD/SD99/BUS/8A		
DATE OF ISSUE	SCALE	SHEET NO.
AUG '01	AS SHOWN	2 OF 3



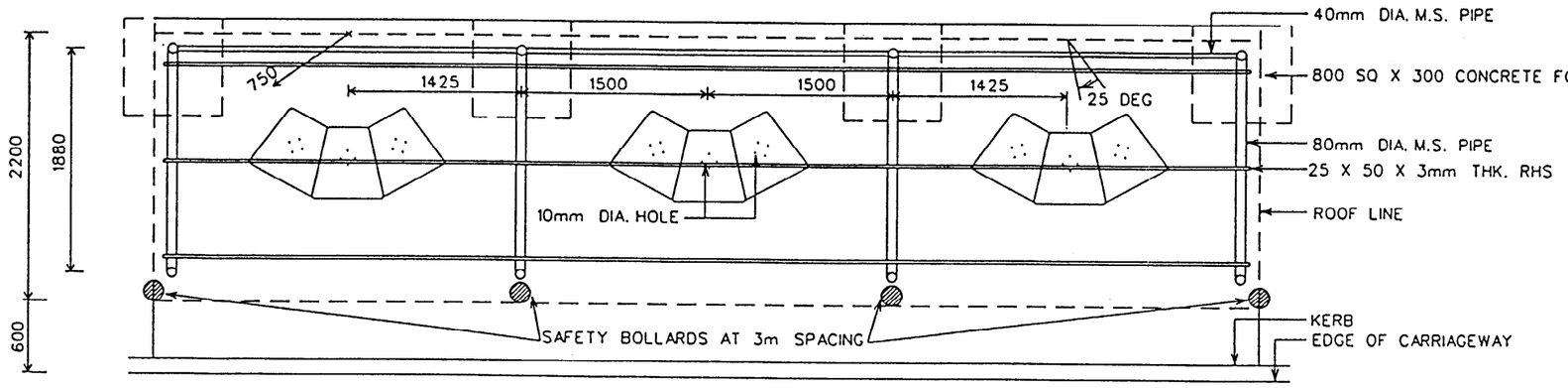
FRONT ELEVATION

1 : 50



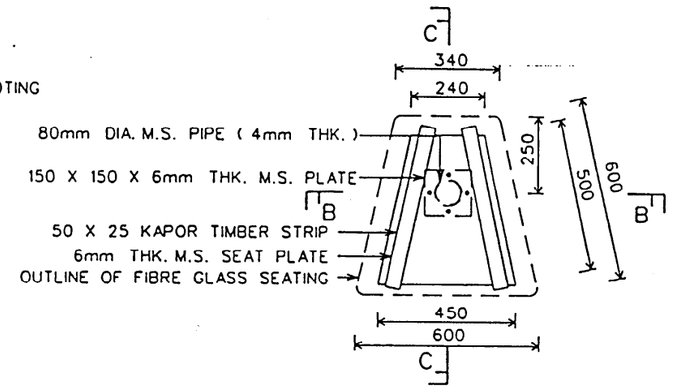
SECTION A-A

1 : 50



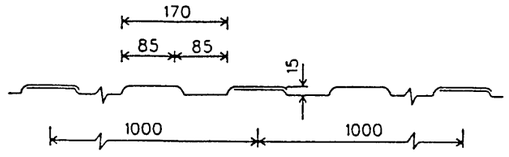
PLAN

1 : 50



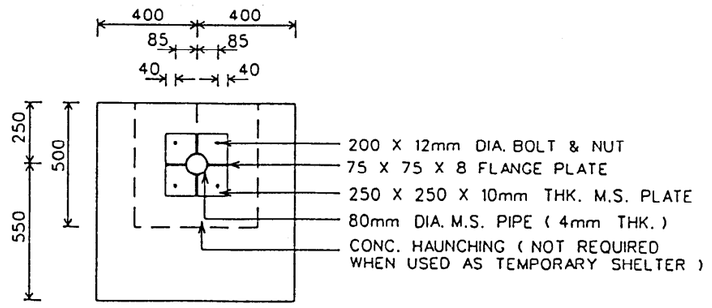
LAYOUT DETAIL OF FIBRE GLASS SEATING

1 : 20



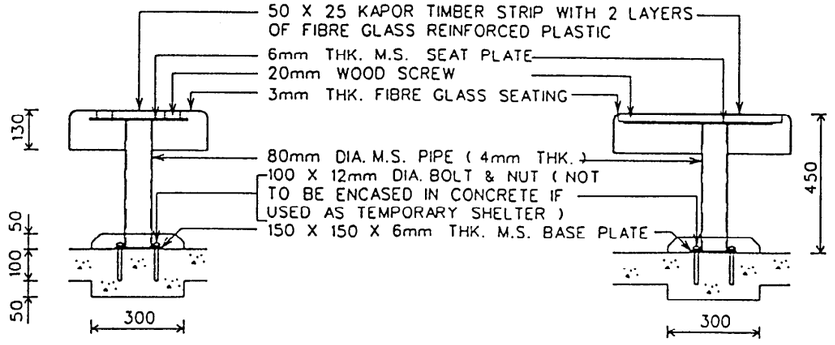
DETAIL OF FIBRE GLASS ROOFING

1 : 10



DETAIL OF POST CONNECTED TO CONCRETE FOOTING

1 : 25



SECTION B-B

1 : 20

SECTION C-C

1 : 20

NOTES:-

1. TYPE A BUS SHELTER SHALL BE USED FOR TEMPORARY SHELTER USE. (WITH 2 UNITS UNLESS OTHERWISE SPECIFIED).
2. ALL PIPES TO BE CLASS MEDIUM (B) IN ACCORDANCE WITH S.S. 17 : 1980.
3. ALL EXPOSED METAL SURFACE TO BE COATED WITH A LAYER OF RED LEAD UNDERCOAT & 2 LAYERS OF FINISHING PAINT OF APPROVED QUALITY AND COLOUR SPECIFIED BY THE S.O.

STANDARD DETAIL

BUS SHELTER
(TYPE A)

Land Transport Authority

DRAWING NO. LTA/RD/SD99/BUS/10A

DATE OF ISSUE	SCALE	SHEET NO.
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NOTES:-

STEEL WORK

1. FABRICATION OF ALL STRUCTURAL STEEL WORK SHALL BE CARRIED OUT IN ACCORDANCE WITH BS 5950. ALL STEEL WORK SHALL BE FABRICATED FROM NEW SECTIONS AND IN SUCH MANNER THAT THEY ARE NOT BENT, TWISTED OR DAMAGED.
2. FABRICATION OF ALL STRUCTURAL STEEL WORK INCLUDING WELDING, TRIMMING & PAINTING SHALL BE INSPECTED AND APPROVED BY S.O.
3. THE MATERIAL FOR ALL STRUCTURAL STEEL WORK SHALL COMPLY WITH BS7613:1994, BS7668:1994,BSEN 10029: PARTS 1 TO 3 OF BSEN 10113:1993, BSEN 10155:1993, AND BSEN 10210 - 1:1994.
4. ALL STEEL SECTION SHALL BE HOT-DIPPED GALVANISED AND TWO COATS OF COMPATIBLE PAINT SHALL BE APPLIED TO ALL DAMAGED SURFACES.
5. ALL CUT EDGES SHALL BE DRESSED TO A NEAT WORKMANLIKE FINISH AND SHALL BE FREE FROM DISTORTIONS.
6. ALL WELDING SHALL BE IN ACCORDANCE WITH BS 5135 & ELECTRODES TO BSEN 449:1995
7. NO SITE WELDING SHALL BE ALLOWED UNLESS APPROVED BY THE S.O.
8. ALL STEEL BOLLARDS, BASS PLATES AND BOLTS TO BE GRADE 43 STEEL.
9. ALL WELD FOR STEEL BOLLARDS TO BASE PLATE TO BE 8mm FILLET WELD OF GRADE 43 AND ELECTRODE STRENGTH E51 UNLESS OTHERWISE STATED.
10. BOLTS SHALL COMPLY WITH BS 4933.
11. ALL BOLTS SHALL BE FITTED WITH WASHERS AND LOCKINGS NUTS COMPLYING WITH BS 4320. NUTS SHALL BE AT LEAST THE STRENGTH GRADE APPROPRIATE TO THE GRADE OF BOLT USED.
12. STAINLESS STEEL HOLDING DOWN BOLTS CONFORMING TO BS 6105:1981 GRADE A4 - 80.
13. PREPARE AND APPLY ONE COAT OF APPROVED TWO PACK ETCHING PRIMER, ONE APPROVED TWO PACK EPOXY UNDERCOAT (DRY FILM THICKNESS 150 MICRONS) AND TWO COATS OF APPROVED TWO PACK POLYURETHENE PAINT (DRY FIRM THICKNESS OF 50 MICRONS) TO ALL GALVANISED METAL SURFACE AND GALVANISED STEEL PIPES TO THE SATISFACTION OF THE SO.

CONCRETE

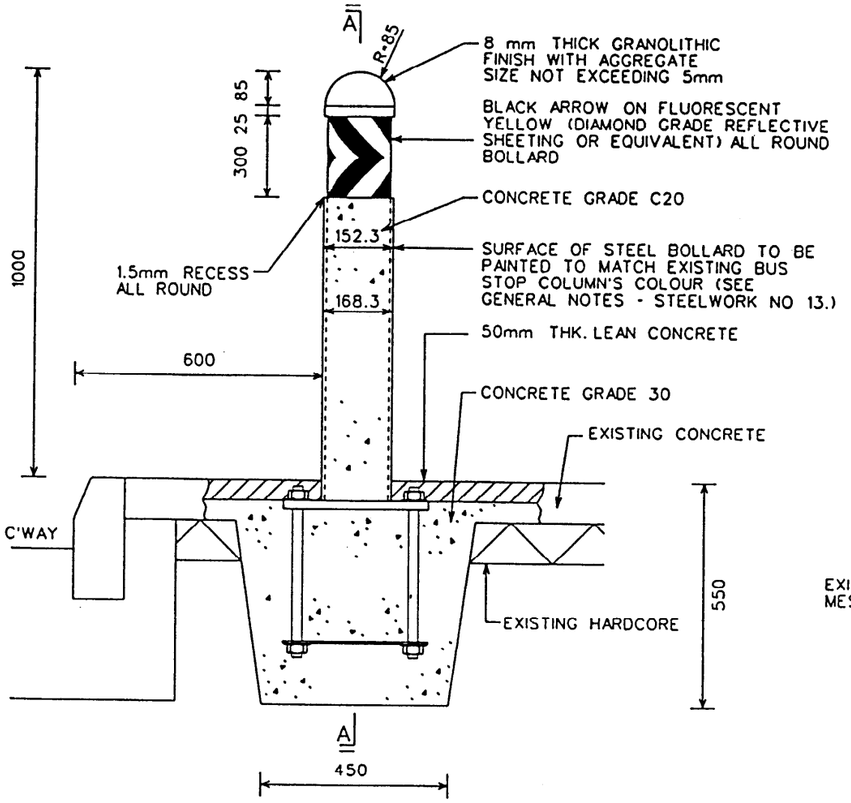
14. THE LIMIT OF CEMENT CONTENT AND CORRESPONDING WATER-CEMENT RATIO AS SPECIFIED IN THE LTA M&W SPECIFICATION SHALL BE STRICTLY ADHERED FOR THE GRADE OF CONCRETE SPECIFIED.
15. MINIMUM CONCRETE COVER TO NEAREST REINFORCEMENT SHALL BE 50mm FOR THE FOUNDATION
16. CONCRETE SHALL BE OF C30 HAVING MINIMUM CUBE COMPRESSIVE STRENGTH OF 30 N/mm2 AT 28 DAYS
17. ALL EXISTING CONCRETE SURFACE SHALL BE PRIMED WITH BONDING AGENT PRIOR TO CASTING OF NEW CONCRETE

REINFORCEMENT

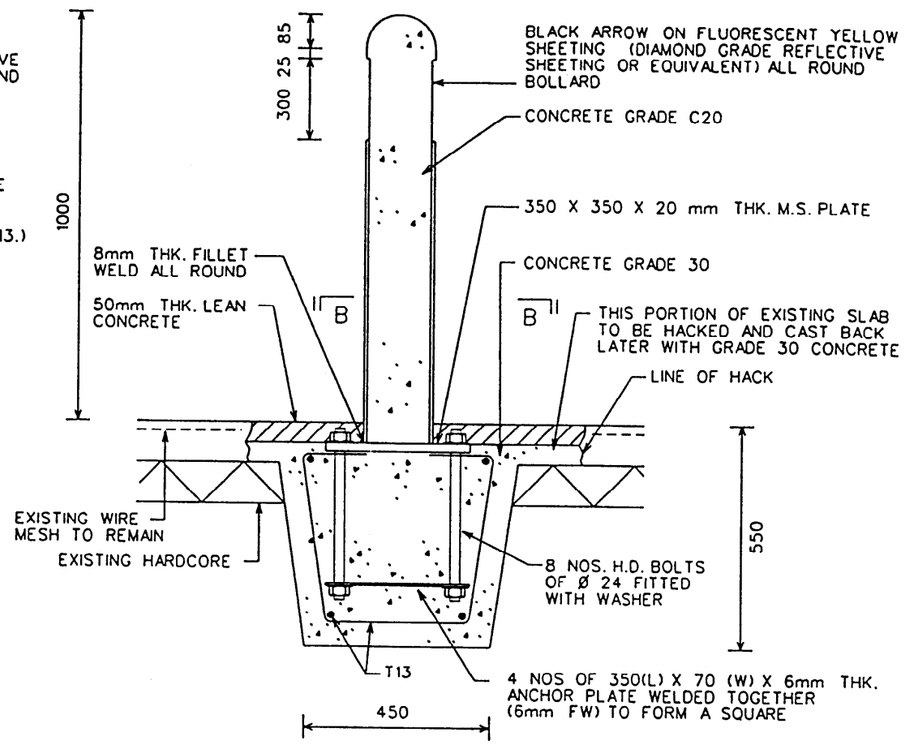
18. ALL STEEL REINFORCEMENT BARS SHALL COMFORM TO BS 4449 AND SS2 1987.
20. 'T' IN STEEL REINFORCEMENT DENOTES HIGH YIELD STEEL OF YIELD STRENGTH -460 N/mm2.
21. REINFORCEMENT TEST CERTIFICATES MUST BE SUBMITTED FOR ACCEPTANCE PRIOR TO CONCRETING WORK

REFLECTIVE SHEETING

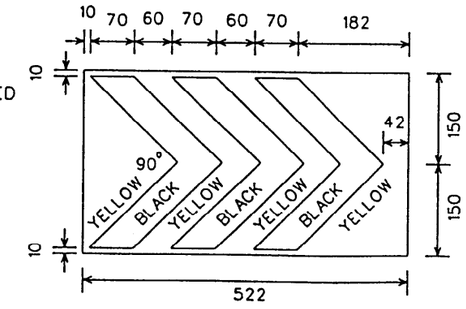
22. BUTT JOINT SHALL BE USED AT THE END OF THE REFLECTIVE SHEETING.
23. 10 mm WIDE APPROVED ACRYLIC ADHESIVE SHALL BE APPLIED ALONG THE BUTT JOINT.



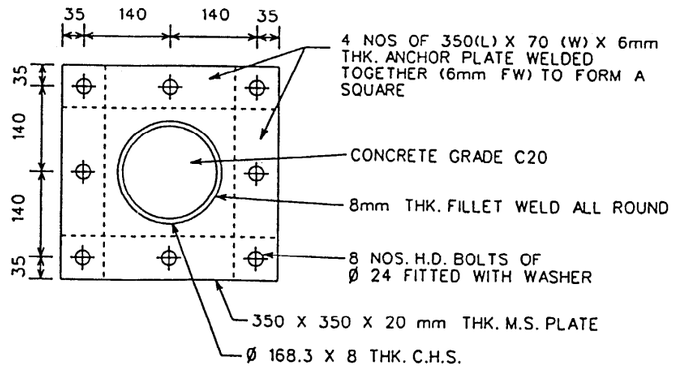
TYPICAL DETAILS OF SAFETY BOLLARD
1 : 10



SECTION A - A
1 : 10



DETAILS OF REFLECTIVE SHEETING
1 : 10



SECTION B - B
1 : 10

STANDARD DETAIL

SAFETY BOLLARD

Land Transport Authority

DRAWING NO. LTA/RD/SD99/BUS/11

DATE OF ISSUE	SCALE	SHEET NO.
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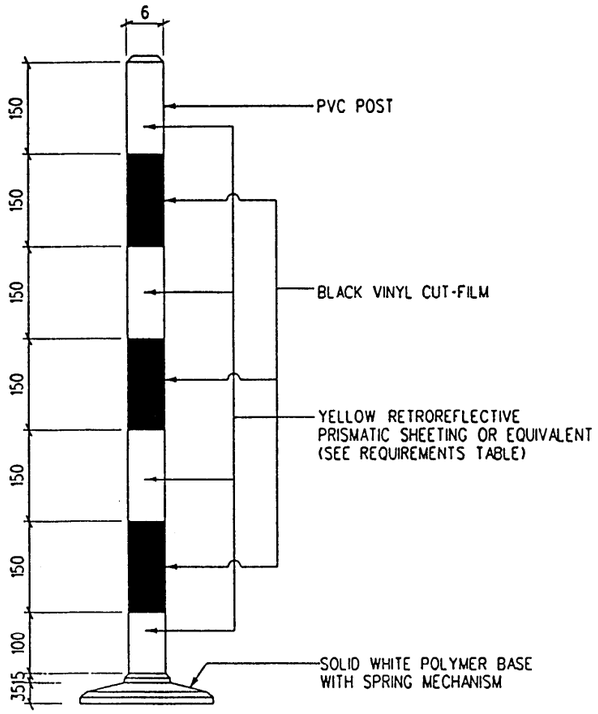
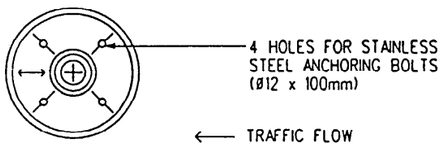
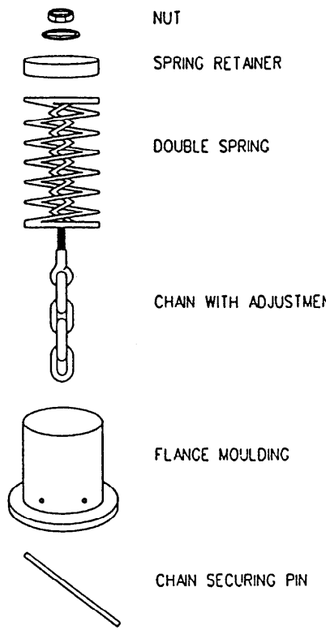




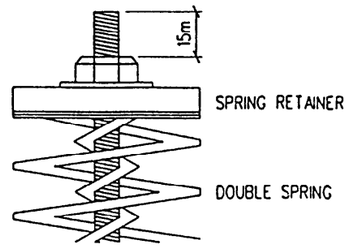
BASE

SCALE 1:10



CHAIN /SPRING ASSEMBLY

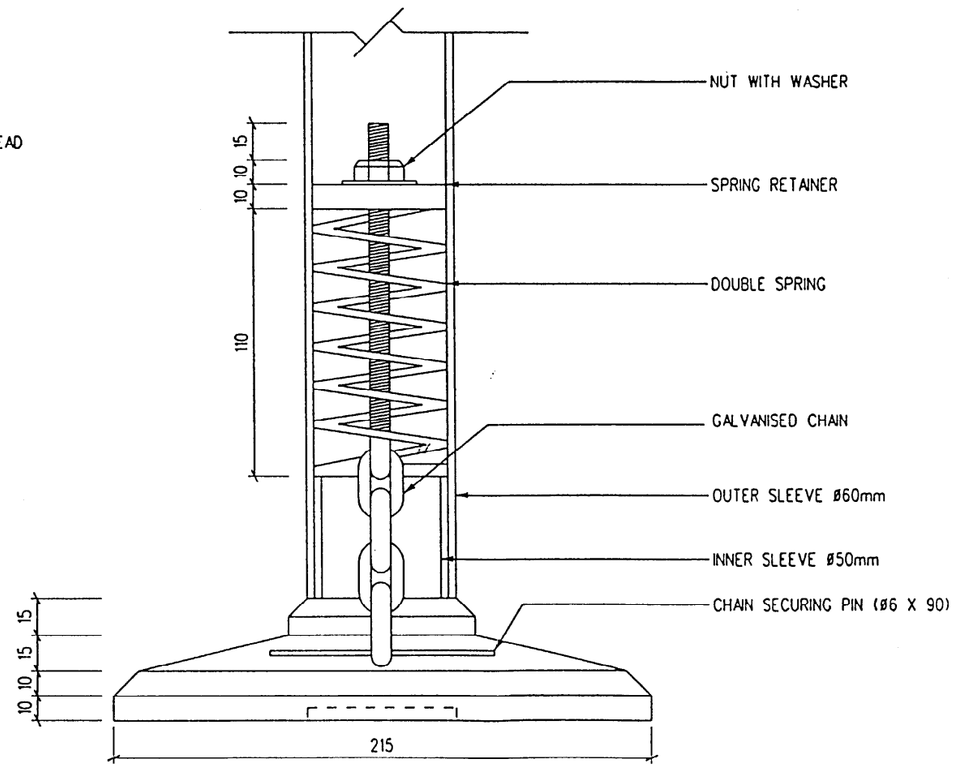
SCALE 1:5



THE DISTANCE OF THE NUT, WHEN SCREW ONTO THE CHAIN ADJUSTMENT THREAD MUST BE 15m

TENSIONING OF SPRING

SCALE 1:2



CROSS SECTION DETAILS

SCALE 1:2.5

OBSERVATION ANGLE	0.2°			0.5°		
ENTRANCE ANGLE	-4°	30°	45°	-4°	30°	45°
YELLOW RETROREFLECTIVE PRISMATIC SHEETING (CANDELAS PER LUX PER SQUARE METRE)	280	170	18	160	100	5

REQUIREMENTS FOR RETROREFLECTIVE PRISMATIC SHEETING

STANDARD DETAIL

SPRING LOADED POST
FOR NARROW DIVIDER
(NOT MORE THAN 400mm WIDE)

Land Transport Authority

DRAWING NO. LTA/RD/SD99/BOL/6

DATE OF ISSUE	SCALE	SHEET NO.
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