APPENDIX B

ENGINERING GUIDELINES FOR THE PREPARATION OF DEVELOPMENT DESIGN PLANS

(In Relation to Engineering Development Consent Conditions)

1.0 PLANS

Are to be presented in a professional manner on quality tracing paper with legible printing (min. height 2.5mm) suitable for microfilming. All drafting, printing or text to be in accordance with AS1100.

DXF files on either $3^1/_2$ or $5^1/_4$ discs of the approved subdivision layout (as per the lodged Deposited Plan) are to be provided to Council.

1.1 SIZE

All plans submitted for approval shall be drawn on standard A1 (full size metric) sheets, regardless of the extent of the work.

1.2 SCALES

(a) Plan - Road & Drainage - 1:500 (min) or as required for clarity.

Note:- Water and sewer plans to be separate and in accordance with the Hunter Water Corporation requirements. Plans to be submitted to Council for information only.

(b) Detail - As required for clarity and all necessary topographic detail.

(c) Long Sections - Generally 1:500 horizontal, 1:100 vertical. Vertical scale may vary in very flat or steep grades.

(d) Cross Sections - 1:100 or 1:200 Natural.

(e) Kerb Return - See kerb return profiles Section 1.8.

(f) Catchment Areas - Australian Standard 1100.

1.3 DRAWING TITLE

All sheets must show the following information in the title block:-

* Development Consent Number.
* Property Description.
* Owner/Developer.
* Surveyor/Engineer.
* Scale and Datum.
* Plan Number and Sheet Number.
* Description of Work on Sheets.

1.4 DETAILS TO BE SHOWN ON PLAN

Preferably general notes to be shown on the first sheet of plans, including:-

> ***"All works to be carried out in accordance with Council's Engineering Requirements for Developments".***

1.5 ROAD PLANS

(a) Site Location.

(b) Centre line chainages as pegged with position and RL of all recovery marks.

(c) The chainage are generally to be aligned with the longitudinal section and run left to right across the plan.

(d) North point to define orientation.

(e) The centre line bearing of straight sections and the radii of curves.

(f) Location, description and RL of bench marks.

(g) Detail of proposed sub-soil lines.

(h) Existing road names and proposed road number/names, property boundary and lot numbers.

(i) Proposed type and alignment of kerbs.

(j) The location and level of all existing services with construction notes relating to any necessary alterations.

(k) The location of proposed drainage structures with pits and headwalls numbered to correspond with drainage calculations and longitudinal section. For clarity drainage details may be shown on a separate drainage plan.

(l) The face of kerb radius of all kerbs.

(m) Existing drainage structures, including size, type and invert levels.

(n) Existing bitumen or existing kerb location and level for a distance either side of the new road location sufficient to determine design grades to the new work.

(o) Show proposed and existing contours at 0.5m intervals, together with any relevant topographical features over the whole site.

(p) The limits of cut and fill batters of significance.

(q) Existing and proposed road reserve boundaries.

(r) Major trees - 0.3 metre diameter and greater measured 1.0m above the ground.

(s) Linemarking plan for road intersections, including Austroads intersection requirements.

1.6 LONGITUDINAL SECTION ROAD WORKS

The chainage should run left to right across the page and the detail to be shown should include:-

(a) Chainages.

(b) Natural surface levels on the pegged centreline.

(c) Design surface level on the pegged centreline.

(d) Details of the vertical alignment.

(e) Grades, size of vertical curves and chainage, and chainage and RL of intersection points.

(f) Datum RL of longitudinal section.

(g) The chainage, size and level of Public Utility mains and services.

(h) Lip levels of the design kerb and gutter.

(i) In rural areas, a horizontal alignment line incorporating guide post locations and linemarking details.

1.7 CROSS SECTIONS

(a) Cross sections should be generally shown at no more than 20 metre intervals and at key points for design purposes, e.g. where access require special design, where cover requirements over services are critical or where superelevation is required at the relevant transition chainages.

(b) They should be placed such that the lowest chainage occupies the bottom left corner of the sheet and run sequentially up the sheet in progressive columns towards the right.

(c) Cross sections should extend for the full road reserve width or for a sufficient distance to detail the proposed method of satisfactorily matching the design and existing surfaces.

(d) Provide sufficient existing cross section profiles and cross falls to show transitions to proposed work where required.

(e) The details to be shown should include:-

* The road centreline chainage in bold print below each section.
* The offset chainage from the pegged centreline.
* The existing surface RL.
* The design surface RL.
* The design crossfall (%).
* The batter slopes (ratio).
* Access grades (%).
* The design centreline shift if applicable.
* The position, size and level of any public utility, mains and services affecting the work.
* Existing and proposed road reserve boundaries.

The above details may be shown on a typical cross section, except where the transitions, superelevation etc., occurs and the varying details must be shown.

1.8 KERB RETURN PROFILES

(a) Each profile should have a kerb return number (e.g. KR2) corresponding with a number shown on the plan view.

The profile should represent the view as looking from the road to the face of the kerb.

(b) The details to be shown include:-

* The horizontal and vertical scale. This scale should be selected to clearly show the convexity of the kerb profile.

* Chainage. The running face of kerb chainage related to the profile, together with the chainage related to the road centrelines.

* Design top of kerb RL.

* Existing top of kerb RL.

* The applicable road/street names/numbers leading into the profile.

* An extension of a minimum of 15 metres beyond the tangent points to ensure a smooth profile is practicable.

* Show location and number of proposed drainage structures.

* Datum RL of kerb return.

1.9 STORMWATER DESIGN

(a) Catchment calculations.

(b) Full catchment details are to be provided for checking with all stormwater drainage design. The extent of the catchment, including that outside the development, must be shown and accounted for in the calculations.

(c) Each pit sub-catchment shall have a reference number/letter which must be consistently used on the catchment plan, drainage calculations sheet, drainage longitudinal sections and kerb returns.

1.10 STORMWATER

(a) Plan.

(b) The stormwater plan may be incorporated on the road plan if space permits. If drawn on a separate plan, the plan view should be generally aligned with the longitudinal section with the chainages running from left to right.

(c) Details to be shown shall include:-

* North point.
* The pit/bend reference number/letter.
* The location of any public utility mains/services crossing influenced by the work.
* The location and centreline chainage of any applicable drainage structure.
* Note stating that all work is to be carried out in accordance with Council's "Engineering Requirements for Developments" and to the satisfaction of Council's Supervising Engineer.
* Location of existing or proposed drainage easements.
* Overland flowpaths, typical sections and capacities.

(d) Longitudinal Section - The longitudinal section shall be plotted on the sheet so that the chainages run left to right across the sheet starting at the downstream end of the system.

Details to be shown shall include:-

* Running chainage along the line, together with road centreline chainage where applicable.
* Pipe design invert level.
* Pipe grade.
* Existing surface level.

* Existing invert of drain where applicable.
* Finished surface level (where pipe crosses or is within roadworks, top of kerb design may be used and specified by 'TK').
* Pipe size, class and type.
* The location, size and level of any public utility main or service that may be affected by the work.
* The pit/bend reference number and type (to be shown above the section together with details of kerb inlet extensions).
* Datum RL of the longitudinal section.
* The hydraulic grade line.
* The velocity - capacity and design flow.
* The pit loss coefficient.
* Bulkhead locations, types and spacing required.

(e) All relevant references to standard drawings and structural details for non-standard drainage structures.

2.0 ENGINEERING SURVEY

2.1 GENERAL

Council's Engineering survey shall accurately show the landforms to facilitate the best possible design and construction of roadworks, drainage and services.

2.2 SITE DETAIL

Prior to any layout design, all physical features that may affect construction are to be located, levelled and plotted on the plan. These include:-

(a) Rock outcrops (including cliffs, caves etc.)

(b) The canopy spread of individual trees 0.3m diameter and larger measured 1.0m 1.0m above the ground unless the tree forms part of a group planting, in which case show the group canopy spread.

(c) Watercourses/ponds and dams.

(d) Man made structures (including existing road formation, kerb and gutter, fences, buildings and vehicle entrances).

(e) Existing drainage structures.

(f) Existing utilities and services.

(g) Contours at 0.5m spacing on normal terrain.

(h) Top and bottom of banks.

2.3 DATUM

Bench marks are to be established clear of any works with a maximum of 200 metres spacing and clearly shown on all working drawings.

They should be a conventional type and constructed according to good survey practice.

2.4 ROADWORKS PEGGING

(a) Centreline Marking - The centreline start chainage shall be the intersection of the centrelines of the new road and the road with which it intersects.

Where an existing road is to be extended, the start chainage should be the intersection of the subject road the last cross or side road.

If this is not practical, the start chainage should be squared off to a suitable property boundary (min. 60m).

The centreline should be marked and the chainage indicated at each cross section according to good survey practice.

Sufficient recovery pegs are to be placed to enable the Construction Overseer to replace the centreline after the earthworks have been completed. It is the surveyors responsibility to ensure that all survey marks are clearly in place at the commencement of construction.

2.5 CROSS SECTIONS

Cross sections are to be provided at 20 metre maximum spacing on straight sections and 15 metre maximum on curves.

A cross section is also to be provided at the tangent points of curves. If superelevation is required, cross sections are to be provided to the superelevation/widening transition development design standards.

The above spacings are a minimum requirement and extra cross sections may be required for the proper design of difficult accesses, culverts and in some cases, for the accurate calculation of earthworks.

The cross section is to be extended for the full width of the road reserve, or further in cases where extra information is necessary.

Cross sections shall be provided for a minimum of 60 metres along existing intersecting roads (in each direction of the intersection).

2.6 LONGITUDINAL SECTION

As for cross sections, the longitudinal sections are to be extended for a minimum of 60 metres along existing intersecting roads to enable proper extension of design.

The longitudinal section of cul-de-sacs shall be carried to the recovery peg on the prolongation of the centreline.

The longitudinal section of an offset cul-de-sac shall be curved to the centre of the turning circle and not in a straight line with an offset to the centre.

2.7 SOIL & WATER MANAGEMENT

These plans shall show kerblines, drainage, sewer and any other civil infrastructure that will require disturbance to the natural environment. The plans shall also show "NO GO AREAS" and proposed fencelines and types to ensure there is no disturbance outside the construction corridors. Other details to be included are as follows:-

(a) Drainage flow paths and physical constrains to development.

(b) Appropriate measures to overcome those constraints.

(c) Mitigation/control of on site soil erosion.

(d) Movement of water onto, through and off the site.

(e) Rehabilitation/maintenance of the works area.

The plan shall contain the best management practices:-

(a) That accord with the appropriate soil loss class.

(b) Are based upon the best available technology which is economically achievable.

2.8 EROSION & SEDIMENT CONTROL PLANS

These plans shall show the location, type and specific details of all sediment and erosion control devices.

Details of sediment basins showing capacity, batter slopes, maintenance access, fencing, spillway, pumping, dosing, stabilising etc. details. Proposed staging of works, revegetation or progressive revegetation details. Stockpile sites and treatments.

IFD ANALYSIS BASED ON AUSTRALIAN RAINFALL & RUNOFF (1987)

Site name: CESSNOCK

Site latitude = 32.50 degrees S
longitude = 151.34 degrees E
skewness = .05

2-year ARI, 1 hour intensity = 27.50 mm/hr
12 hour intensity = 5.76 mm/hr
72 hour intensity = 1.75 mm/hr

50-year ARI, 1 hour intensity = 50.00 mm/hr
12 hour intensity = 11.80 mm/hr
72 hour intensity = 3.50 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	70.78	90.87	117.26	132.83	153.44	180.66	201.56	222.91	251.97
6 min	66.28	85.04	109.55	123.98	143.11	168.35	187.73	207.50	234.40
10 min	54.12	69.29	88.79	100.20	115.39	135.38	150.69	166.29	187.48
12 min	49.99	63.96	81.78	92.20	106.07	124.32	138.29	152.50	171.80
15 min	45.14	57.70	73.58	82.84	95.19	111.42	123.82	136.44	153.54
18 min	41.37	52.84	67.23	75.59	86.77	101.45	112.66	124.05	139.48
20 min	39.28	50.14	63.71	71.58	82.12	95.94	106.50	117.21	131.73
24 min	35.81	45.68	57.89	64.96	74.45	86.88	96.35	105.97	118.99
30 min	31.85	40.58	51.27	57.44	65.74	76.60	84.86	93.25	104.58
45 min	25.48	32.39	40.69	45.44	51.87	60.26	66.64	73.09	81.79
1.0 hr	21.60	27.42	34.29	38.21	43.54	50.47	55.73	61.04	68.20
1.5 hr	16.80	21.39	26.96	30.16	34.48	40.13	44.43	48.78	54.66
2.0 hr	14.01	17.86	22.65	25.41	29.13	33.99	37.70	41.47	46.56
3.0 hr	10.81	13.82	17.66	19.91	22.90	26.83	29.84	32.90	37.05
4.5 hr	8.33	10.68	13.76	15.58	17.98	21.15	23.59	26.07	29.46
6.0 hr	6.92	8.90	11.53	13.09	15.15	17.87	19.97	22.11	25.03
9.0 hr	5.34	6.88	8.99	10.25	11.91	14.11	15.80	17.54	19.92
12.0 hr	4.44	5.74	7.54	8.62	10.04	11.93	13.39	14.89	16.94
18.0 hr	3.45	4.46	5.84	6.67	7.76	9.21	10.33	11.48	13.06
24.0 hr	2.88	3.71	4.86	5.55	6.45	7.65	8.58	9.53	10.83
30.0 hr	2.49	3.22	4.21	4.80	5.57	6.61	7.40	8.22	9.34
36.0 hr	2.21	2.85	3.73	4.25	4.93	5.84	6.55	7.27	8.25
48.0 hr	1.82	2.35	3.06	3.48	4.04	4.78	5.36	5.94	6.75
72.0 hr	1.35	1.74	2.27	2.58	2.99	3.54	3.96	4.39	4.97

FIG 1

IFD ANALYSIS BASED ON AUSTRALIAN RAINFALL & RUNOFF (1987)

Site name: BRANXTON

Site latitude = 32.67 degrees S
longitude = 151.33 degrees E
skewness = .10

2-year ARI, 1 hour intensity = 27.50 mm/hr
12 hour intensity = 5.60 mm/hr
72 hour intensity = 1.70 mm/hr

50-year ARI, 1 hour intensity = 51.00 mm/hr
12 hour intensity = 11.00 mm/hr
72 hour intensity = 3.50 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	70.60	90.50	117.58	133.93	155.57	184.51	207.00	230.19	262.09
6 min	66.12	84.70	109.88	125.05	145.15	172.02	192.89	214.39	243.96
10 min	53.97	69.03	89.12	101.17	117.18	138.54	155.09	172.11	195.49
12 min	49.86	63.72	82.11	93.12	107.77	127.29	142.41	157.95	179.27
15 min	45.02	57.49	73.91	83.71	96.77	114.16	127.61	141.43	160.38
18 min	41.26	52.65	67.55	76.42	88.26	104.01	116.19	128.69	145.81
20 min	39.17	49.96	64.02	72.38	83.56	98.41	109.88	121.65	137.77
24 min	35.71	45.52	58.20	65.72	75.79	89.16	99.48	110.07	124.55
30 min	31.76	40.44	51.56	58.15	66.98	78.68	87.70	96.95	109.59
45 min	25.40	32.29	40.95	46.05	52.92	62.00	68.99	76.13	85.88
1.0 hr	21.54	27.34	34.54	38.76	44.46	51.99	57.77	63.67	71.72
1.5 hr	16.70	21.23	26.92	30.27	34.78	40.75	45.34	50.03	56.44
2.0 hr	13.89	17.67	22.47	25.31	29.12	34.16	38.04	42.02	47.45
3.0 hr	10.68	13.61	17.38	19.61	22.60	26.57	29.63	32.76	37.05
4.5 hr	8.21	10.47	13.42	15.18	17.52	20.64	23.05	25.52	28.90
6.0 hr	6.81	8.69	11.17	12.65	14.63	17.26	19.29	21.37	24.24
9.0 hr	5.24	6.69	8.64	9.80	11.35	13.42	15.02	16.67	18.93
12.0 hr	4.35	5.56	7.20	8.18	9.49	11.23	12.58	13.97	15.88
18.0 hr	3.37	4.32	5.61	6.39	7.42	8.81	9.88	10.99	12.51
24.0 hr	2.80	3.60	4.69	5.35	6.22	7.39	8.30	9.24	10.54
30.0 hr	2.43	3.12	4.07	4.65	5.41	6.44	7.24	8.06	9.20
36.0 hr	2.15	2.76	3.62	4.14	4.82	5.74	6.45	7.19	8.21
48.0 hr	1.77	2.27	2.98	3.42	3.99	4.75	5.35	5.97	6.83
72.0 hr	1.31	1.69	2.23	2.56	2.99	3.58	4.03	4.51	5.16

FIG 2

IFD ANALYSIS BASED ON AUSTRALIAN RAINFALL & RUNOFF (1987)

Site name: GRETA

Site latitude = 32.68 degrees S
longitude = 151.38 degrees E
skewness = .07

2-year ARI, 1 hour intensity = 28.00 mm/hr
12 hour intensity = 5.70 mm/hr
72 hour intensity = 1.75 mm/hr

50-year ARI, 1 hour intensity = 52.30 mm/hr
12 hour intensity = 11.40 mm/hr
72 hour intensity = 3.60 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	71.76	92.14	119.51	135.85	157.43	186.12	208.28	231.00	262.11
6 min	67.20	86.25	111.71	126.89	146.96	173.63	194.21	215.31	244.18
10 min	54.86	70.31	90.69	102.79	118.83	140.09	156.48	173.25	196.17
12 min	50.68	64.91	83.59	94.66	109.35	128.81	143.80	159.14	180.07
15 min	45.77	58.57	75.27	85.14	98.27	115.63	129.00	142.66	161.31
18 min	41.95	53.65	68.82	77.77	89.68	105.44	117.55	129.94	146.81
20 min	39.82	50.91	65.24	73.68	84.93	99.80	111.23	122.90	138.81
24 min	36.31	46.39	59.33	66.94	77.10	90.51	100.80	111.32	125.64
30 min	32.29	41.22	52.60	59.27	68.19	79.95	88.97	98.18	110.71
45 min	25.84	32.92	41.81	47.00	53.97	63.13	70.15	77.30	87.01
1.0 hr	21.90	27.88	35.29	39.60	45.40	53.01	58.64	64.77	72.81
1.5 hr	16.98	21.65	27.52	30.96	35.56	41.62	46.27	51.00	57.43
2.0 hr	14.12	18.02	22.99	25.90	29.80	34.93	38.87	42.89	48.36
3.0 hr	10.86	13.88	17.79	20.09	23.16	27.21	30.33	33.52	37.86
4.5 hr	8.34	10.68	13.75	15.56	17.98	21.18	23.64	26.16	29.60
6.0 hr	6.91	8.87	11.45	12.99	15.03	17.73	19.81	21.94	24.86
9.0 hr	5.32	6.83	8.86	10.07	11.68	13.81	15.46	17.15	19.46
12.0 hr	4.41	5.67	7.39	8.41	9.77	11.57	12.96	14.40	16.36
18.0 hr	3.43	4.41	5.76	6.57	7.64	9.06	10.16	11.29	12.84
24.0 hr	2.86	3.69	4.82	5.50	6.40	7.59	8.52	9.48	10.79
30.0 hr	2.48	3.20	4.18	4.78	5.56	6.61	7.42	8.25	9.40
36.0 hr	2.20	2.84	3.72	4.25	4.95	5.88	6.61	7.35	8.38
48.0 hr	1.81	2.34	3.07	3.51	4.09	4.87	5.47	6.09	6.94
72.0 hr	1.35	1.74	2.29	2.63	3.07	3.66	4.11	4.58	5.23

FIG 3

IFD ANALYSIS BASED ON AUSTRALIAN RAINFALL & RUNOFF (1987)

Site name: KURRI KURRI

Site latitude = 32.80 degrees S
longitude = 151.50 degrees E
skewness = .05

2-year ARI, 1 hour intensity = 30.00 mm/hr
12 hour intensity = 6.20 mm/hr
72 hour intensity = 1.90 mm/hr

50-year ARI, 1 hour intensity = 57.00 mm/hr
12 hour intensity = 13.50 mm/hr
72 hour intensity = 4.00 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	76.41	98.08	126.53	143.31	165.52	194.86	217.39	240.39	271.70
6 min	71.57	91.84	118.40	134.05	154.78	182.15	203.16	224.61	253.80
10 min	58.47	74.97	96.43	109.06	125.80	147.89	164.82	182.10	205.60
12 min	54.02	69.25	89.00	100.60	116.01	136.31	151.88	167.76	189.34
15 min	48.60	62.53	80.27	90.69	104.52	122.75	136.72	150.96	170.32
18 min	44.74	57.30	73.50	82.99	95.61	112.23	124.96	137.94	155.57
20 min	42.48	54.40	69.73	78.72	90.67	106.40	118.45	130.73	147.40
24 min	38.74	49.60	63.51	71.66	82.50	96.76	107.69	118.81	133.92
30 min	34.47	44.11	56.41	63.60	73.18	85.79	95.43	105.25	118.57
45 min	27.59	35.28	45.01	50.68	58.26	68.21	75.81	83.55	94.04
1.0 hr	23.41	29.91	38.09	42.85	49.21	57.57	63.95	70.44	79.23
1.5 hr	18.16	23.28	29.91	33.81	38.98	45.80	51.03	56.36	63.61
2.0 hr	15.11	19.41	25.11	28.48	32.93	38.81	43.34	47.96	54.26
3.0 hr	11.63	14.99	19.56	22.30	25.89	30.65	34.33	38.10	43.26
4.5 hr	8.93	11.56	15.23	17.44	20.33	24.18	27.17	30.24	34.45
6.0 hr	7.41	9.61	12.75	14.65	17.13	20.44	23.02	25.67	29.31
9.0 hr	5.70	7.42	9.93	11.47	13.46	16.14	18.23	20.39	23.37
12.0 hr	4.74	6.18	8.32	9.65	11.35	13.66	15.46	17.32	19.90
18.0 hr	3.69	4.80	6.45	7.47	8.78	10.55	11.92	13.35	15.32
24.0 hr	3.08	4.01	5.38	6.21	7.30	8.76	9.89	11.07	12.69
30.0 hr	2.67	3.48	4.65	5.37	6.31	7.56	8.54	9.55	10.94
36.0 hr	2.37	3.09	4.12	4.76	5.58	6.69	7.55	8.44	9.66
48.0 hr	1.96	2.54	3.39	3.90	4.57	5.47	6.17	6.90	7.89
72.0 hr	1.46	1.89	2.52	2.89	3.39	4.05	4.56	5.09	5.81

FIG 4

IFD ANALYSIS BASED ON AUSTRALIAN RAINFALL & RUNOFF (1987)

Site name: MULBRING

Site latitude = 32.91 degrees S
longitude = 151.48 degrees E
skewness = .06

2-year ARI, 1 hour intensity = 30.50 mm/hr
12 hour intensity = 6.60 mm/hr
72 hour intensity = 2.20 mm/hr

50-year ARI, 1 hour intensity = 59.50 mm/hr
12 hour intensity = 14.00 mm/hr
72 hour intensity = 4.50 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	77.38	99.42	128.83	146.33	169.43	200.07	223.68	247.86	280.88
6 min	72.48	93.11	120.62	136.97	158.57	187.21	209.29	231.89	262.75
10 min	59.21	76.03	98.39	111.68	129.23	152.49	170.41	188.75	213.79
12 min	54.71	70.24	90.86	103.11	119.29	140.73	157.25	174.15	197.22
15 min	49.42	63.44	82.02	93.05	107.63	126.94	141.81	157.03	177.80
18 min	45.30	58.14	75.14	85.22	98.56	116.22	129.82	143.73	162.71
20 min	43.02	55.21	71.33	80.88	93.53	110.27	123.17	136.35	154.35
24 min	39.23	50.34	65.01	73.70	85.20	100.44	112.16	124.15	140.51
30 min	34.90	44.78	57.79	65.50	75.70	89.21	99.60	110.23	124.72
45 min	27.94	35.83	46.19	52.32	60.44	71.18	79.44	87.89	99.40
1.0 hr	23.70	30.38	39.14	44.31	51.17	60.24	67.21	74.34	84.05
1.5 hr	18.55	23.82	30.85	35.03	40.55	47.87	53.51	59.29	67.17
2.0 hr	15.53	19.97	25.97	29.55	34.27	40.53	45.37	50.33	57.11
3.0 hr	12.05	15.54	20.32	23.19	26.96	31.98	35.86	39.85	45.31
4.5 hr	9.35	12.07	15.88	18.17	21.18	25.20	28.31	31.52	35.91
6.0 hr	7.80	10.09	13.33	15.29	17.85	21.28	23.95	26.69	30.46
9.0 hr	6.06	7.85	10.43	12.00	14.04	16.79	18.92	21.13	24.17
12.0 hr	5.06	6.57	8.76	10.10	11.85	14.19	16.02	17.91	20.51
18.0 hr	4.01	5.20	6.92	7.96	9.32	11.15	12.57	14.04	16.06
24.0 hr	3.40	4.40	5.83	6.71	7.85	9.37	10.56	11.79	13.47
30.0 hr	2.98	3.85	5.10	5.86	6.85	8.17	9.20	10.26	11.72
36.0 hr	2.67	3.45	4.56	5.23	6.11	7.29	8.20	9.14	10.44
48.0 hr	2.23	2.88	3.80	4.35	5.08	6.05	6.80	7.57	8.64
72.0 hr	1.70	2.19	2.88	3.29	3.83	4.56	5.12	5.70	6.49

FIG 5

IFD ANALYSIS BASED ON AUSTRALIAN RAINFALL & RUNOFF (1987)

Site name: PAXTON

Site latitude = 32.91 degrees S
longitude = 151.29 degrees E
skewness = .07

2-year ARI, 1 hour intensity = 27.50 mm/hr
12 hour intensity = 5.90 mm/hr
72 hour intensity = 1.84 mm/hr

50-year ARI, 1 hour intensity = 49.80 mm/hr
12 hour intensity = 11.75 mm/hr
72 hour intensity = 3.80 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	70.68	90.58	116.86	132.46	153.15	180.57	201.70	223.34	252.90
6 min	66.20	84.79	109.19	123.65	142.84	168.27	187.85	207.90	235.25
10 min	54.06	69.11	88.51	99.95	115.19	135.32	150.79	166.60	188.13
12 min	49.95	63.80	81.54	91.97	105.89	124.27	138.37	152.78	172.38
15 min	45.11	57.57	73.37	82.64	95.03	111.37	123.90	136.68	154.06
18 min	41.35	52.72	67.04	75.41	86.63	101.41	112.73	124.26	139.94
20 min	39.26	50.03	63.53	71.41	81.99	95.90	106.56	117.41	132.16
24 min	35.80	45.58	57.74	64.82	74.33	86.84	96.41	106.15	119.36
30 min	31.85	40.51	51.15	57.32	65.64	76.57	84.91	93.40	104.90
45 min	25.49	32.35	40.60	45.35	51.80	60.24	66.67	73.20	82.03
1.0 hr	21.62	27.39	34.22	38.14	43.48	50.45	55.75	61.13	68.39
1.5 hr	16.89	21.44	26.96	30.15	34.46	40.12	44.43	48.80	54.73
2.0 hr	14.12	17.96	22.69	25.43	29.13	33.98	37.69	41.46	46.57
3.0 hr	10.94	13.95	17.74	19.95	22.91	26.82	29.81	32.86	37.00
4.5 hr	8.47	10.82	13.85	15.63	18.01	21.15	23.55	26.02	29.37
6.0 hr	7.07	9.04	11.62	13.15	15.18	17.87	19.93	22.05	24.93
9.0 hr	5.47	7.02	9.09	10.32	11.94	14.10	15.77	17.47	19.81
12.0 hr	4.57	5.87	7.63	8.69	10.08	11.92	13.35	14.82	16.83
18.0 hr	3.56	4.58	5.98	6.81	7.91	9.38	10.52	11.68	13.28
24.0 hr	2.98	3.84	5.01	5.72	6.65	7.90	8.86	9.85	11.21
30.0 hr	2.59	3.33	4.36	4.98	5.80	6.89	7.74	8.60	9.80
36.0 hr	2.30	2.96	3.89	4.44	5.17	6.15	6.91	7.69	8.76
48.0 hr	1.90	2.45	3.22	3.68	4.29	5.11	5.74	6.39	7.29
72.0 hr	1.42	1.83	2.42	2.77	3.24	3.86	4.34	4.84	5.53

FIG (

IFD ANALYSIS BASED ON AUSTRALIAN RAINFALL & RUNOFF (1987)

Site name: WOLLOMBI

Site latitude = 32.94 degrees S
longitude = 151.14 degrees E
skewness = .06

2-year ARI, 1 hour intensity = 27.30 mm/hr
12 hour intensity = 5.90 mm/hr
72 hour intensity = 1.75 mm/hr

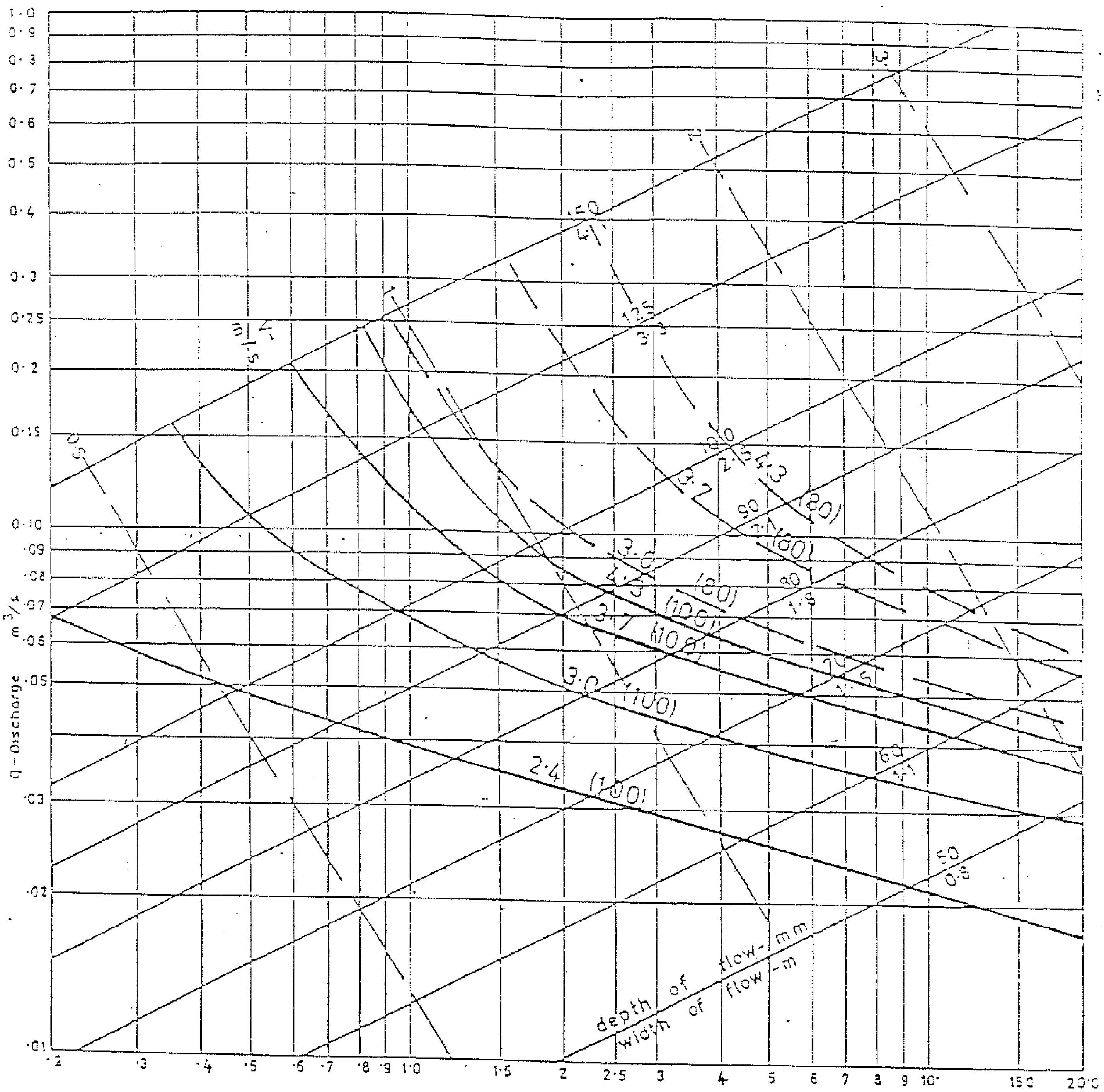
50-year ARI, 1 hour intensity = 49.70 mm/hr
12 hour intensity = 12.00 mm/hr
72 hour intensity = 3.65 mm/hr

IFD Table for Various ARIs and Durations

Duration	1 yr	2 yr	5 yr	10 yr	20 yr	50 yr	100 yr	200 yr	500 yr
5 min	70.17	90.05	116.30	131.86	152.46	179.72	200.71	222.18	251.47
6 min	65.72	84.28	108.66	123.09	142.21	167.49	186.94	206.83	233.94
10 min	53.66	68.69	88.09	99.50	114.68	134.72	150.09	165.78	187.14
12 min	49.58	63.41	81.15	91.56	105.43	123.72	137.74	152.04	171.49
15 min	44.77	57.21	73.02	82.27	94.62	110.89	123.34	136.04	153.29
18 min	41.04	52.39	66.72	75.08	86.26	100.97	112.23	123.70	139.26
20 min	38.96	49.72	63.23	71.10	81.64	95.50	106.10	116.88	131.52
24 min	35.53	45.29	57.46	64.53	74.02	86.48	96.00	105.68	118.80
30 min	31.60	40.24	50.90	57.07	65.37	76.25	84.56	93.00	104.43
45 min	25.29	32.13	40.40	45.16	51.59	60.01	66.41	72.90	81.68
1.0 hr	21.44	27.20	34.05	37.98	43.31	50.26	55.54	60.89	68.12
1.5 hr	16.76	21.32	26.89	30.10	34.44	40.11	44.44	48.83	54.77
2.0 hr	14.03	17.88	22.66	25.44	29.17	34.07	37.81	41.61	46.76
3.0 hr	10.88	13.90	17.76	20.01	23.02	26.99	30.03	33.13	37.33
4.5 hr	8.43	10.80	13.90	15.73	18.15	21.36	23.83	26.34	29.77
6.0 hr	7.03	9.03	11.68	13.26	15.34	18.10	20.22	22.40	25.36
9.0 hr	5.45	7.02	9.15	10.43	12.11	14.34	16.06	17.83	20.25
12.0 hr	4.56	5.88	7.70	8.80	10.24	12.16	13.64	15.17	17.26
18.0 hr	3.52	4.54	5.96	6.82	7.94	9.44	10.60	11.80	13.44
24.0 hr	2.92	3.77	4.96	5.68	6.62	7.87	8.84	9.85	11.22
30.0 hr	2.52	3.25	4.29	4.91	5.73	6.82	7.66	8.53	9.73
36.0 hr	2.23	2.88	3.80	4.35	5.08	6.05	6.80	7.58	8.64
48.0 hr	1.82	2.36	3.11	3.57	4.17	4.97	5.59	6.24	7.12
72.0 hr	1.35	1.74	2.31	2.65	3.10	3.70	4.17	4.65	5.31

FIG 7

COLLECTION CAPACITIES OF GRATED KERB INLET PITS WITH DEFLECTORS



NOTES:
1. K & G CAPACITY - MANNING FORMULA
2. CROSSFALL 3%
3. n= 0·015
4. CURVED LINES INDICATE LINTEL LENGTH IN METRES AND PERCENT COLLECTION OF GUTTER FLOW

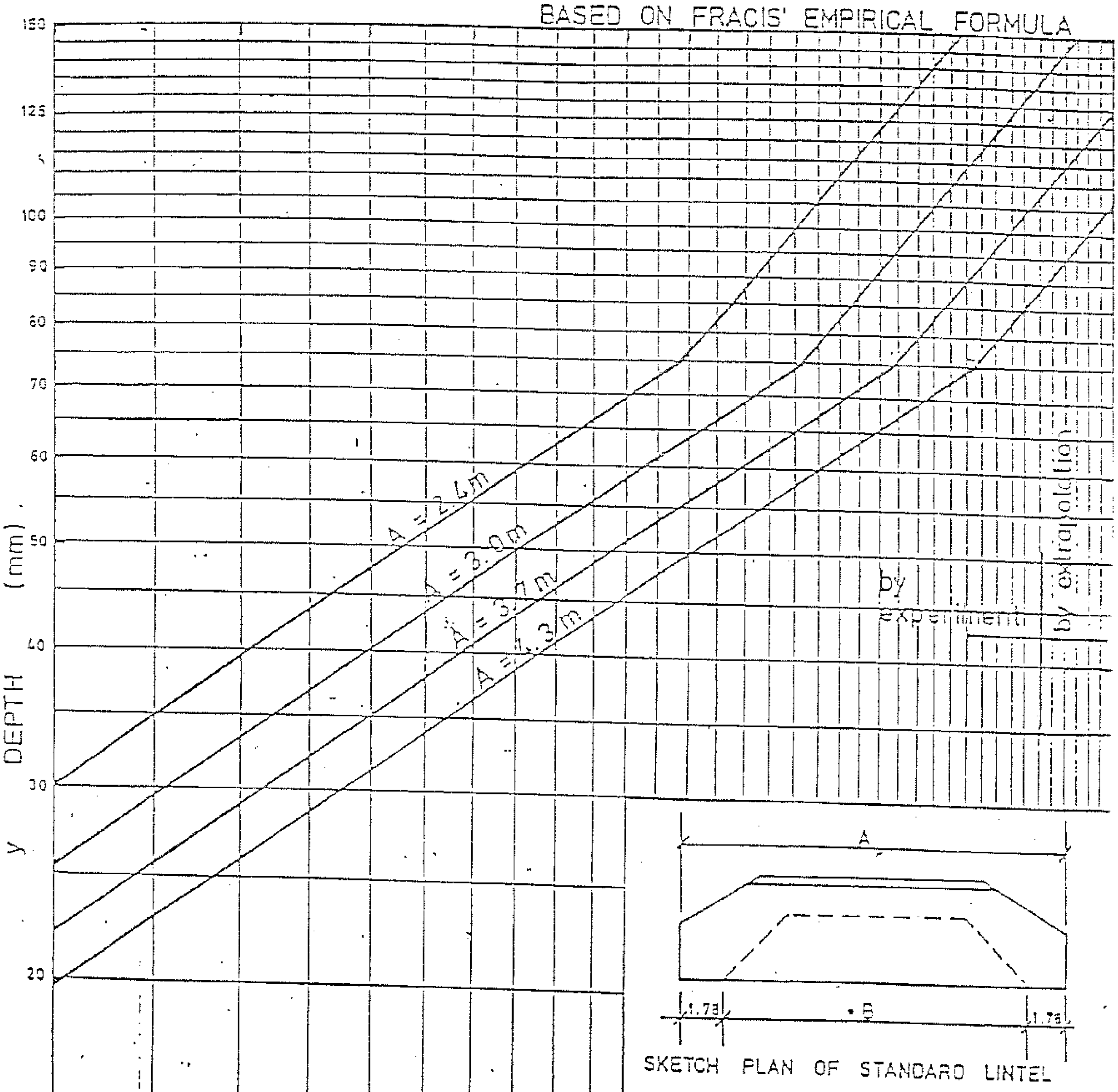
FIG 8

SAG INLET CAPACITIES — CROSSFALL 3 %

$Q_i = \frac{2}{3} C_d \sqrt{2g}\,(B - 0.1 n H_2)\,H_2^{3/2}$ FOR $H_2 \leq 0.075$m

$Q_i = \frac{2}{3} C_d \sqrt{2g}\,B\,(H_2^{3/2} - H_1^{3/2})$ FOR $H_2 > 0.075$m

WHERE
- Q_i = INLET CAPACITY ($m^3 s^{-1}$)
- B = LINTEL OPENING (m)
- n = No. OF END CONTRACTIONS = 2
- H_2 = y DEPTH (m)
- H_1 = $(H_2 - 0.075)$ (m)
- C_d = 0.62



Am	Bm
2.4	2.1
3.0	2.7
3.7	3.3
4.3	3.9

DIMENSION 'A' THE OVERALL LENGTH IS TO BE USED FOR ORDERING PURPOSES

FIG 9

TABLE 6.5

APPROXIMATE VALUES FOR COEFFICIENT K_w: PIPES CONCURRENT OR AT RIGHT ANGLES

1. INTRODUCTION

Figure (a) represents a general, simple junction pit layout with upstream, lateral and grating inflows, Q_u, Q_l and Q_g respectively.

By assigning values to these parameters all possible simple junction pit configurations can be described. Figure (b) is an elevation section through the pit taken along the alignment of its discharge pipe, diameter D_o. The K_w values listed are based on the findings of Sangster et al (1958) known as 'Missouri Charts', de Groot and Boyd (1983), Black and Piggott (1983).

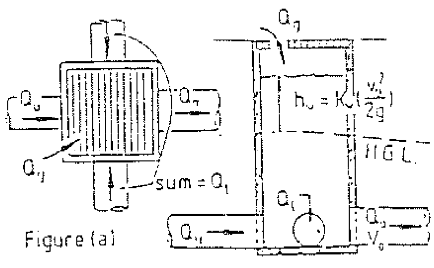


Figure (a)

Figure (b)

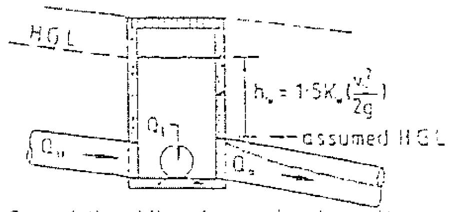
2. JUNCTION PITS WITHOUT GUTTER FLOW

CODE	DESCRIPTION	$Q_u \approx$	$Q_l \approx$	Q_g	$K_w =$
J-1	Junction pit on through pipeline, i.e. $Q_u = Q_o$	Q_o	-	-	0.2
	Junction pit on through pipe with lateral(s)				
J-2A	. $Q_u >> Q_l$	Q_o	some	-	0.5
J-2B	. $Q_u \approx Q_l$	$Q_o/2$	$Q_o/2$	-	1.0
J-2C	. $Q_u << Q_l$	some	Q_o	-	2.0
J-3	Junction pit on 'L' pipe junction, i.e. $Q_u = 0$	-	Q_o	-	2.0
	Junction pit on 'T' pipe junction, i.e. $Q_u = 0$				
J-3A	. opposed laterals	-	Q_o	-	2.5
J-3B	. offset laterals	-	Q_o	-	2.0

3. INLET/JUNCTION PITS WITH GUTTER FLOW

CODE	DESCRIPTION	$Q_u \approx$	$Q_l \approx$	$Q_g \approx$	$K_w =$
I-1	Inlet pit with single pipe outflow	-	-	Q_o	4.0
	Inlet on through pipeline				
I-2A	. $Q_u \approx Q_g$	$Q_o/2$	-	$Q_o/2$	2.0
I-2B	. $Q_u \approx Q_o$	Q_o	-	some	0.5
	Inlet on through pipe with lateral(s)				
I-3A	. $Q_u >> Q_l$	Q_o	some	some	0.5
I-3B	. $Q_u > Q_l$	$Q_o/2$	some	$Q_o/2$	1.5
I-3C	. $Q_u \approx Q_l$	$Q_o/2$	$Q_o/2$	some	1.5
I-3D	. $Q_u << Q_l$	some	Q_o	some	2.0
I-3E	. $Q_u < Q_l$	some	$Q_o/2$	$Q_o/2$	2.5
I-4	Inlet on 'L' pipe junction i.e. $Q_u = 0$	-	Q_o	some	2.5
	Inlet on 'T' pipe junction - i.e. $Q_u = 0$				
I-5A	. opposed laterals	-	Q_o	some	3.0
I-5B	. offset laterals	-	Q_o	some	2.5

4. PART-FULL OUTFLOW FROM JUNCTION PITS



Part-full outflow from a junction pit.

Situations frequently arise, particularly in upper-basin catchments of moderate/steep grade, where pipes operate part-full. Water level build-up in pits supplying these pipes is, typically above obvert level (see sketch). Bannigan and Morgan (1981) have suggested for such situations that the hydraulic grade line be set at (discharge) pipe obvert level and the height, h_w, fixed in the same manner as other cases considered in Tables 6.5 and 6.6. The value of V_o required in the calculation of h_w is given by $V_o = Q_o/A_o$ where A_o is discharge pipe full area.

No experimental or field validation of this has to date been presented. Results of a pilot study carried out at S.A. Institute of Technology show water level build-up can be significantly greater than $K_w\ (V_o^2/2g)$. It is therefore recommended that the Bannigan and Morgan approach be adopted with h_w fixed by:

$$h_w = 1.5\ K_w \left[\frac{V_o^2}{2g}\right]$$

The results of current research will in time yield a more accurate relationship.

TABLE 6.6

APPROXIMATE VALUES FOR COEFFICIENT K_w: PIPES NEITHER CONCURRENT NOR MEETING AT RIGHT ANGLES

1. JUNCTION PIT WITH SINGLE ENTRY/EXIT PIPES

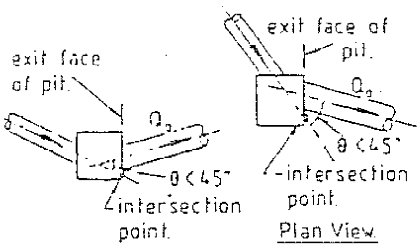
Hare's (1983) research on the hydraulics of single entry/exit pits with pipes neither concurrent nor meeting at 90 degrees, shows that the pit water level headloss coefficient, K_w, which should be applied to the hydraulic grade line at these structures is dependent on two main factors:

(i) the location of the entry pipe centreline (produced) intersection with pit walls; and

(ii) the magnitude of gutter flow, Q_g.

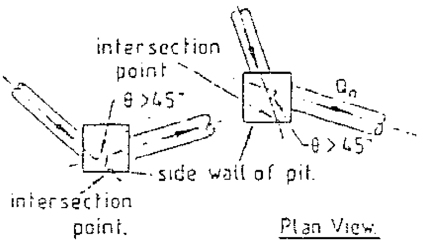
For deviation angle, $\theta < 45°$:

Examples:



For deviation angle, $\theta > 45°$:

Examples:



K_w values recommended are:

$\theta < 45°$: $K_w = 0.5$ for $Q_g = 0$ or small quantity;

$K_w = 1.5$ for $Q_g \approx Q_o/2$

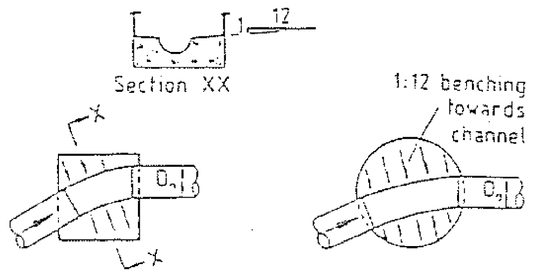
$\theta > 45°$: $K_w = 2.5$ (with or without gutter flow)

Research suggests that hydraulic shaping of pits to assist the passage of flow from entry to exit can be effective.

Pit dimensions Small pits, generally, result in smaller headlosses than large pits.

Circular pits Results of unpublished research by R.G. Black and T.L. Piggot of Queensland Institute of Technology, when compared with the results of Hare (1983), show marginally improved performance for circular pits in situation which would otherwise, i.e. using rectangular pits, fall into the cases considered above.

Internal shaping 'Benching' of pits to provide a curved channel $D_o/2$ deep between entry and exit pipes (see sketch) can reduce K_w values obtained in $\theta > 45°$ situations from 2.5 to about 1.5 (Archer et al 1978). It appears to make no significant improvement in $\theta < 45°$ situations. Similar findings are reported in Dick and Marsalek (1985).



Benching in a rectangular junction pit

Benching in a circular junction pit

2. DROP JUNCTION PITS

It is often necessary in steep terrain or when an existing service (water main, electricity cable, etc.) must be avoided to construct junction pit entry and exit pipes at significantly different levels. Unpublished research by Black and Piggot (QIT) and Logan City Council (1983) suggests the following values for the pit water level headloss coefficient K_w:

$\theta < 45°$ situations:

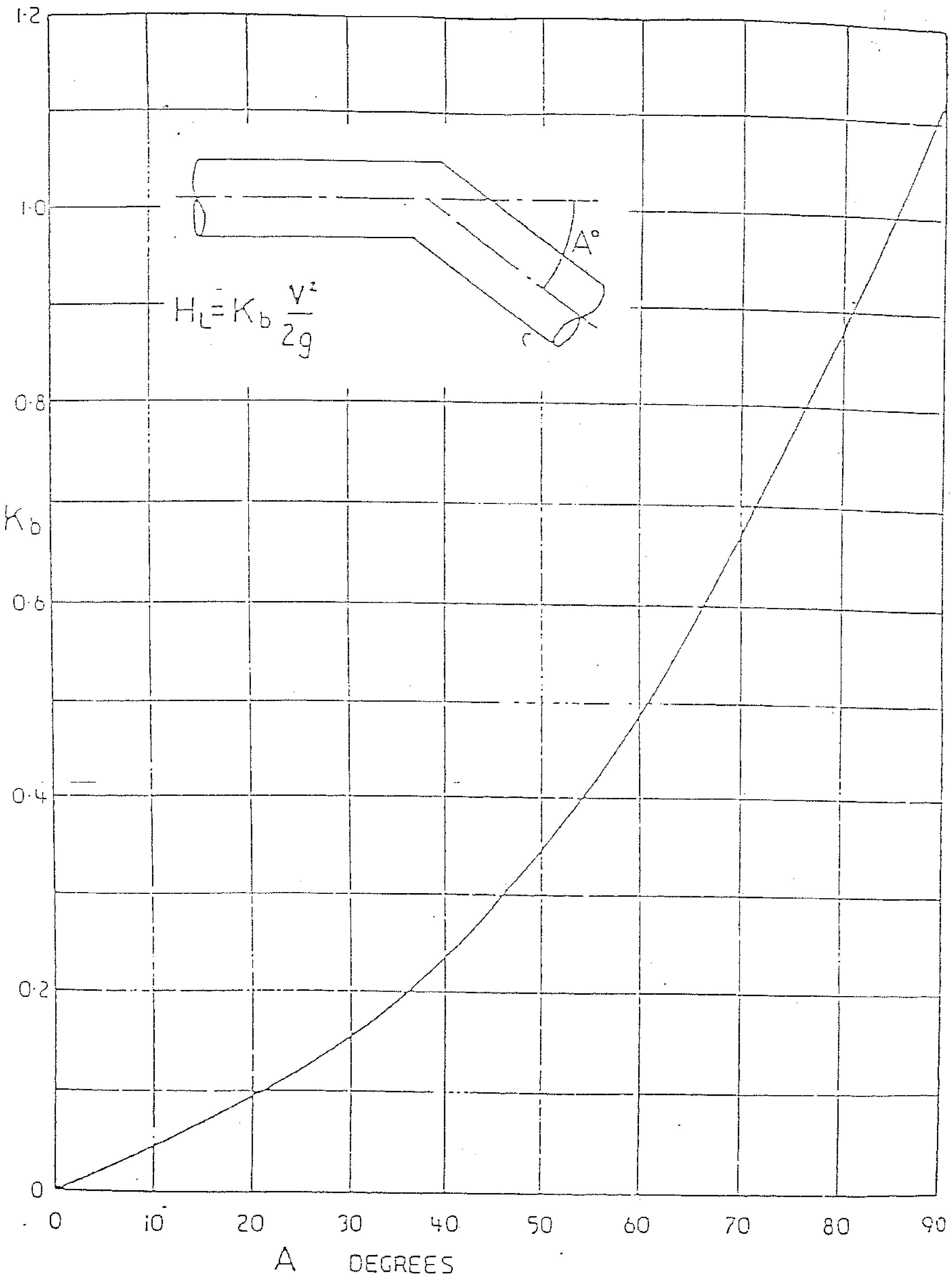
rectangular pits, $K_w = 2.0$;
circular pits, $K_w = 1.5$

$\theta > 45°$ situations:

rectangular pits, $K_w = 2.5$;
circular pits, $K_w = 2.0$

Use of these values of K_w is restricted to installations in which both pipe obverts (entry and exit) are submerged under design flow conditions AND there is no gutter flow. It is considered unlikely that gutter flow, if present, will affect the listed values of K_w, but this is presently unresearched.

Some designers prefer to break vertical alignment and introduce a short length of steeply sloping pipe (slope, say, 1 vertical to 4 horizontal), if necessary, in preference to using a drop pit. They argue that the headloss thus introduced, although unknown, must be less than that occurring at a drop pit. Designers following this practice are entitled to use slightly reduced values for K_w.



LOSS COEFFICIENTS FOR MITER BENDS

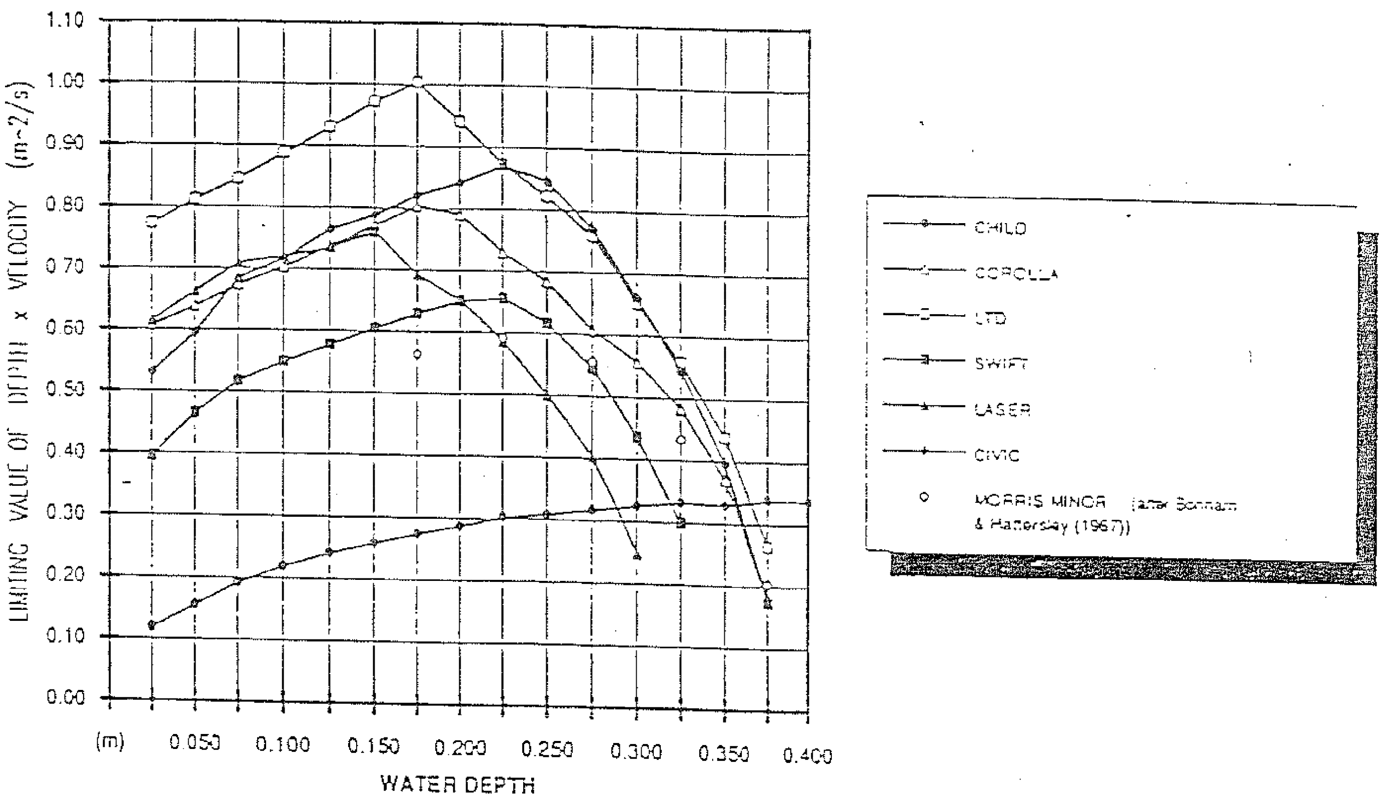
U.S. CORPS OF ENGINEERS

FIG. 10

URBAN STREET AS A FLOODWAY

* In the design of an urban street as a floodway, the actual flow depth must be taken into account when establishing an appropriate design value of V x D. R.J. Keller and B.F. Mitsch, in their paper "Stability of Cars and Children in Flooded Streets" suggest appropriate values of V x D to be adopted in lieu of the 0.4 value given in Section 1 of AR & R.

The writers suggest that the use of a single value in isolation is inappropriate. They recommend that the design graph given below (Fig 12.1) be used as a rational design aid to determine safe values of V x D.

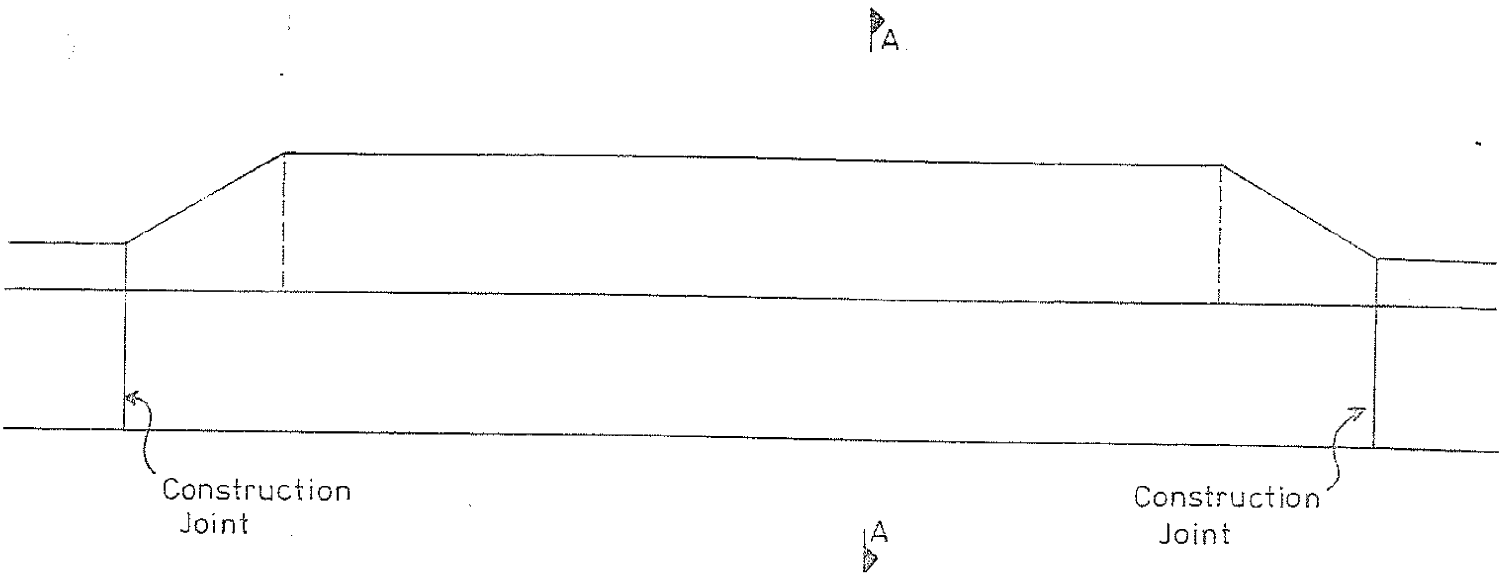


Composite Limiting Stability Diagram

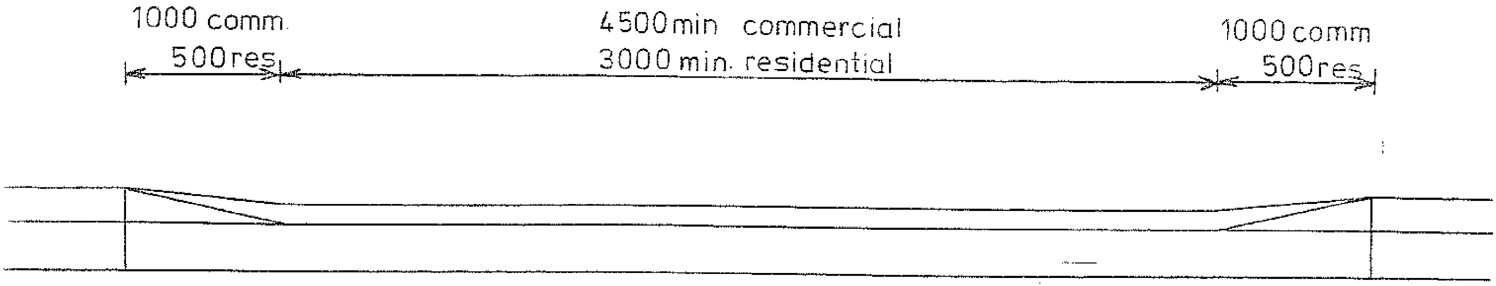
From paper by R.J. Keller and B.F. Mitsch
"Stability of Cars and Children in Flooded Streets"
International Symposium on Urban Stormwater Management February 1992.
Institution of Engineers, Australia.

Limiting Values of V x D

FIG 13

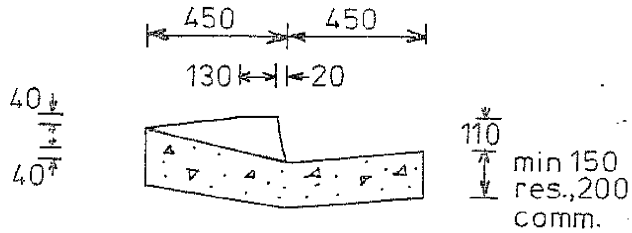


PLAN



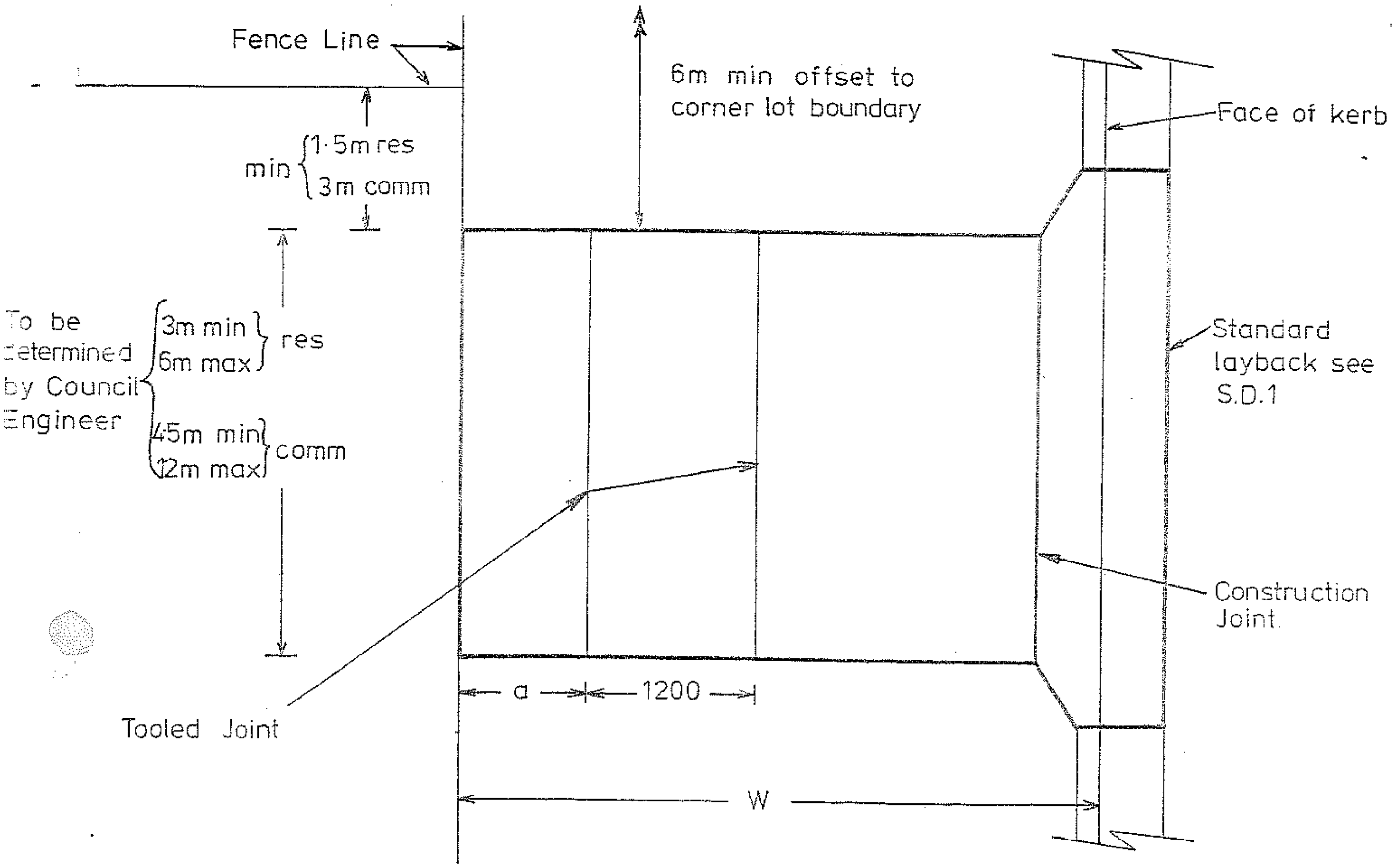
ELEVATION

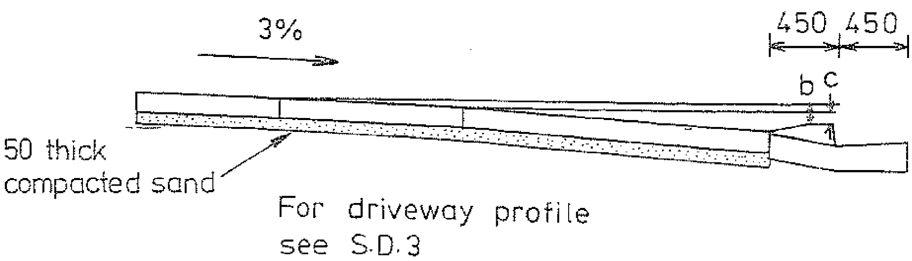
NOTE 1. For commercial entrances, two layers of F82 fabric are to be provided top and bottom with 50 cover.
2. Concrete is to have a compressive strength of 20MPa at 28 days.
3. All steel reinforcement is to have 50 cover.
4. All dimensions are shown in millimetres.



SECTION AA

CESSNOCK CITY COUNCIL	DRAWN DATE	
	C.D. 10·2·86	S.D. 1
LAYBACK IN KERB AND GUTTER FOR VEHICULAR ENTRANCES	APPROVED G. Robinson	





Residential Crossing

125 thick slab reinforced with F62 Fabric in top, 30 cover

Concrete compressive strength to be 20MPa at 28 days.

Commercial Crossing

150 thick slab reinforced with F72 Fabric in top, 50 cover

Concrete compressive strength to be 25MPa at 28 days

NOTE 1. Steel reinforcing shall not extend through construction joints.

2. All steel reinforcing to have 50 cover unless shown otherwise

3. All dimensions in millimetres unless shown otherwise

Heavy Duty Commercial Crossing

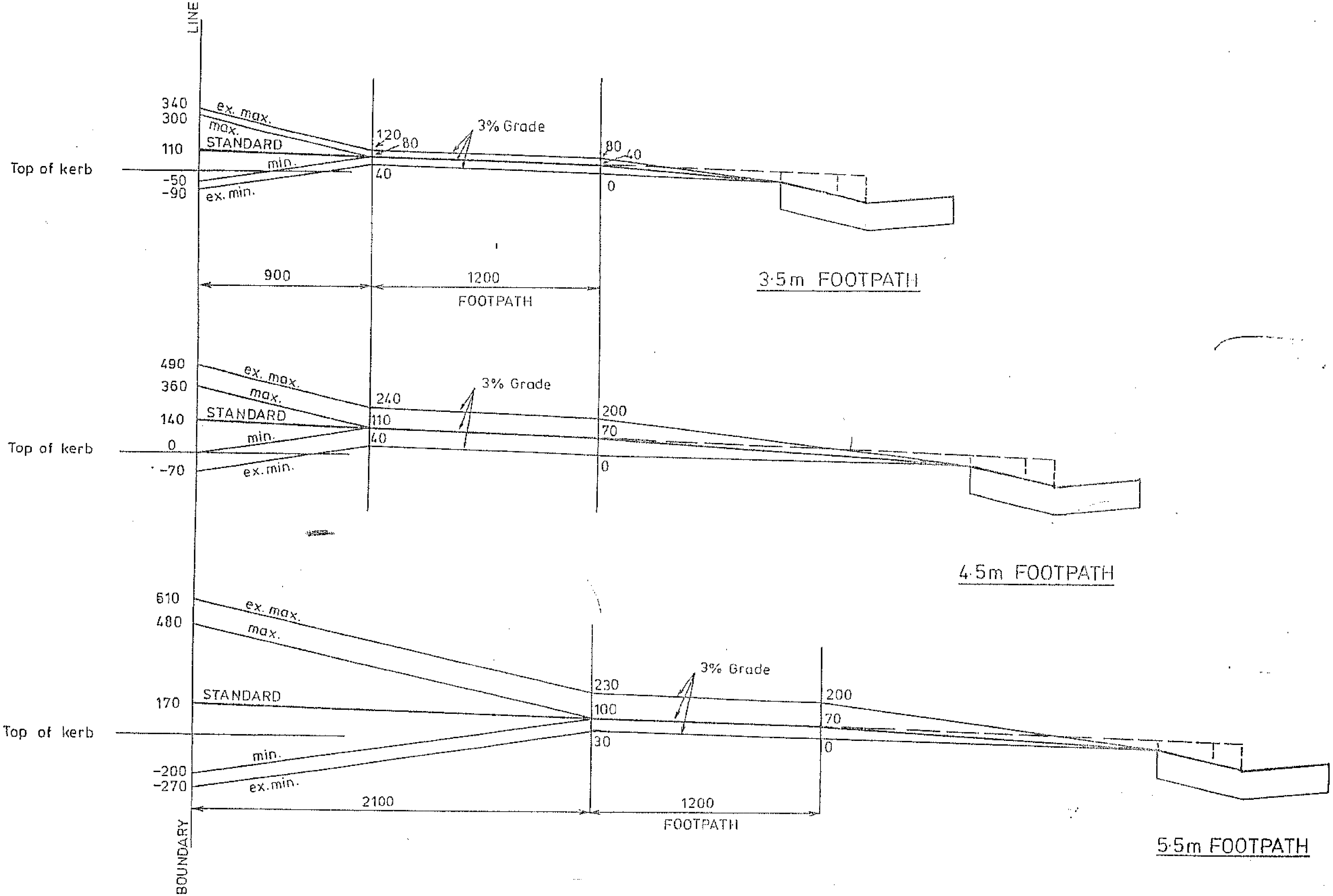
150 thick slab reinforced with F72 Fabric top and bottom, 50 cover

Concrete compressive strength to be 30MPa at 28 days.

W(mm)	* a(mm)	* b(mm)	* c(mm)
3500	900	110	40
3670	900	110	40
4500	900	140	70
5500	2100	170	70

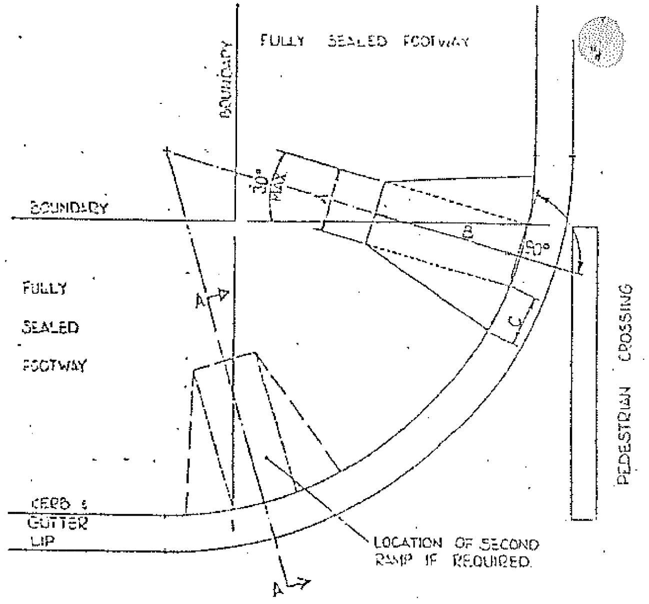
* May be varied by Council Engineer in special circumstances (See S.D.3)

CESSNOCK CITY COUNCIL	DRAWN DATE	
STANDARD FOOTPATH CROSSING	C.D. 13·2·86	S.D. 2
	APPROVED G. Robinson	

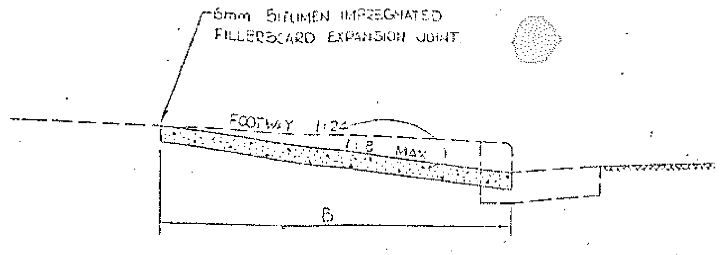


NOTE:
1. All dimensions are above or below top of kerb.
2. Crossings between max. and ex. max., min. and ex. min. are sub standard and applicants should be informed that most modern cars should not incur difficulty, but the crossing is not guaranteed.

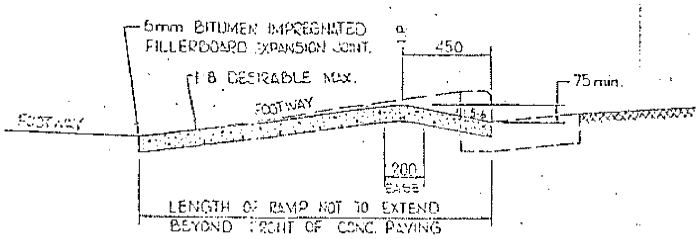
CESSNOCK CITY COUNCIL	DRAWN C D	DATE 22·2·85	S.D. 3
STANDARD DRIVEWAY PROFILES 1:20	APPROVED		



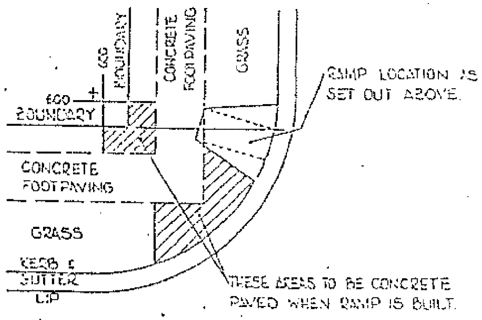
PREFERRED LOCATION OF KERB RAMPS AT KERB RETURNS



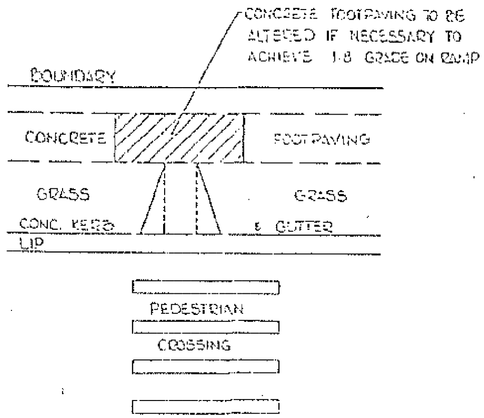
SECTION A-A
NORMAL LEVEL FOOTWAY



LOW LEVEL FOOTWAY



NOTE: CONCRETE FOOTPAVING AT CORNER TO BE LOWERED IF NECESSARY TO ACHIEVE A 1:8 GRADE ON RAMP.



RAMP DIMENSIONS (FOR 1:8 GRADE)

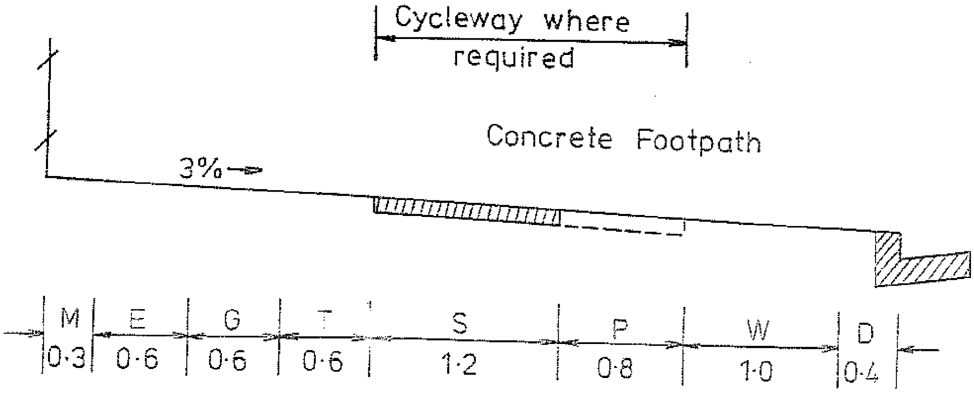
DIMENSION		INTEGRAL KERB & GUTTER 150 mm HIGH	200 mm HIGH
A	MINIMUM	800	800
	DESIRABLE	900	900
B		1800	2400 *
+ C		600	800

LENGTH OF RAMP 'B' TO BE DETERMINED ON SITE - LENGTH WILL VARY FROM ABOVE TABLE DEPENDING ON KERB HEIGHT AND FOOTWAY GRADIENT.
DIMENSION 'B' IN TABLE BASED ON NORMAL FOOTWAY CROSSFALL OF 1:24.
+ WIDTH OF SPLAY TO BE DETERMINED ON SITE - RATIO OF KERB HEIGHT TO SPLAY WIDTH TO BE 1:4
* ONLY PRACTICAL WHERE FOOTWAY IS 4.25m OR WIDER.

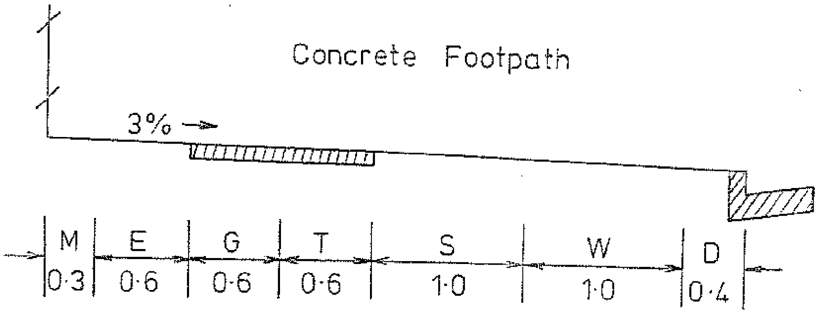
NOTES

1. WIDTH OF SPLAY MAY BE DECREASED IF NECESSARY TO CLEAR PUBLIC UTILITIES.
2. STREET NAME SIGNS, PARKING SIGNS ETC. TO BE RELOCATED IF NECESSARY.
3. LEVEL OF FIRE HYDRANTS, GAS SYPHONS ETC. TO BE ADJUSTED WHERE THEY OCCUR WITHIN RAMP AREA.
4. THE POSITION OF RAMPS MAY BE CHANGED FROM THE PREFERRED LOCATION WHERE THERE ARE MAJOR OBSTRUCTIONS (e.g. POWER POLES, TELECOM PITS, DRAINAGE PITS etc.).
5. WHERE IT IS IMPRACTICAL TO POSITION A RAMP SQUARE TO THE KERB & GUTTER IT MAY BE POSITIONED ON A SKEW WITH THE SHORTER SIDE HAVING A MAX. GRADE OF 1:8.
6. GENERALLY ONE RAMP TO BE PROVIDED AT EACH CORNER IN THE MAIN DIRECTION OF PEDESTRIAN MOVEMENT.
7. TWO RAMPS TO BE PROVIDED AT A CORNER ONLY IF CONSIDERED ESSENTIAL (e.g AT PEDESTRIAN CROSSINGS OR TRAFFIC LIGHTS).
8. WHERE POSSIBLE RAMPS ARE TO BE LOCATED DOWNSTREAM FROM ADJACENT SUMPS.
9. RAMPS ARE TO BE LOCATED WITHIN THE LIMITS OF PEDESTRIAN CROSSINGS.
10. CONCRETE IS TO BE A MINIMUM OF 20 MPa.
11. RAMP SHALL HAVE A WOOD FLOAT OR COVING TROWEL FINISH CARRIED TO THE EDGE OF ALL SLOPED SURFACES.
12. AT ACUTE ANGLE CORNERS WHERE IT IS IMPRACTICAL TO PROVIDE TWO SEPERATE RAMPS, CONSTRUCT ONE CENTRALLY LOCATED RAMP.
13. IN SOME HIGH AND LOW LEVEL FOOTWAY SITUATIONS THE DESIRABLE GRADIENT OF 1:8 MAY BE EXCEEDED.
14. LOW LEVEL FOOTWAY RAMPS WILL PRESENT PROBLEMS TO SOME USERS:
 i) LOW SET WHEELCHAIR FOOTRESTS COULD SCRAPE ON THE LAYBACK SECTION.
 ii) THE 1:5.6 GRADIENT OF THE LAYBACK MAY BE TOO STEEP FOR SOME USERS TO NEGOTIATE.
15. RAMPS ARE TO BE PROVIDED IN CONJUNCTION WITH NEW CONCRETE FOOTWAY PAVING OR NEW KERB AND GUTTER AT ALL INTERSECTIONS.

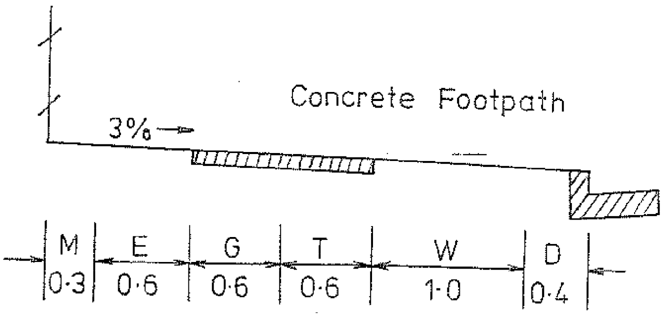
DRAWN	SURVEY :	SCALE :	CESSNOCK CITY COUNCIL
CHECKED :	DESIGN :	DATUM	FOOTWAY KERB RAMPS
FILE No. :			SD4



5·5m FOOTPATH



4·5m FOOTPATH

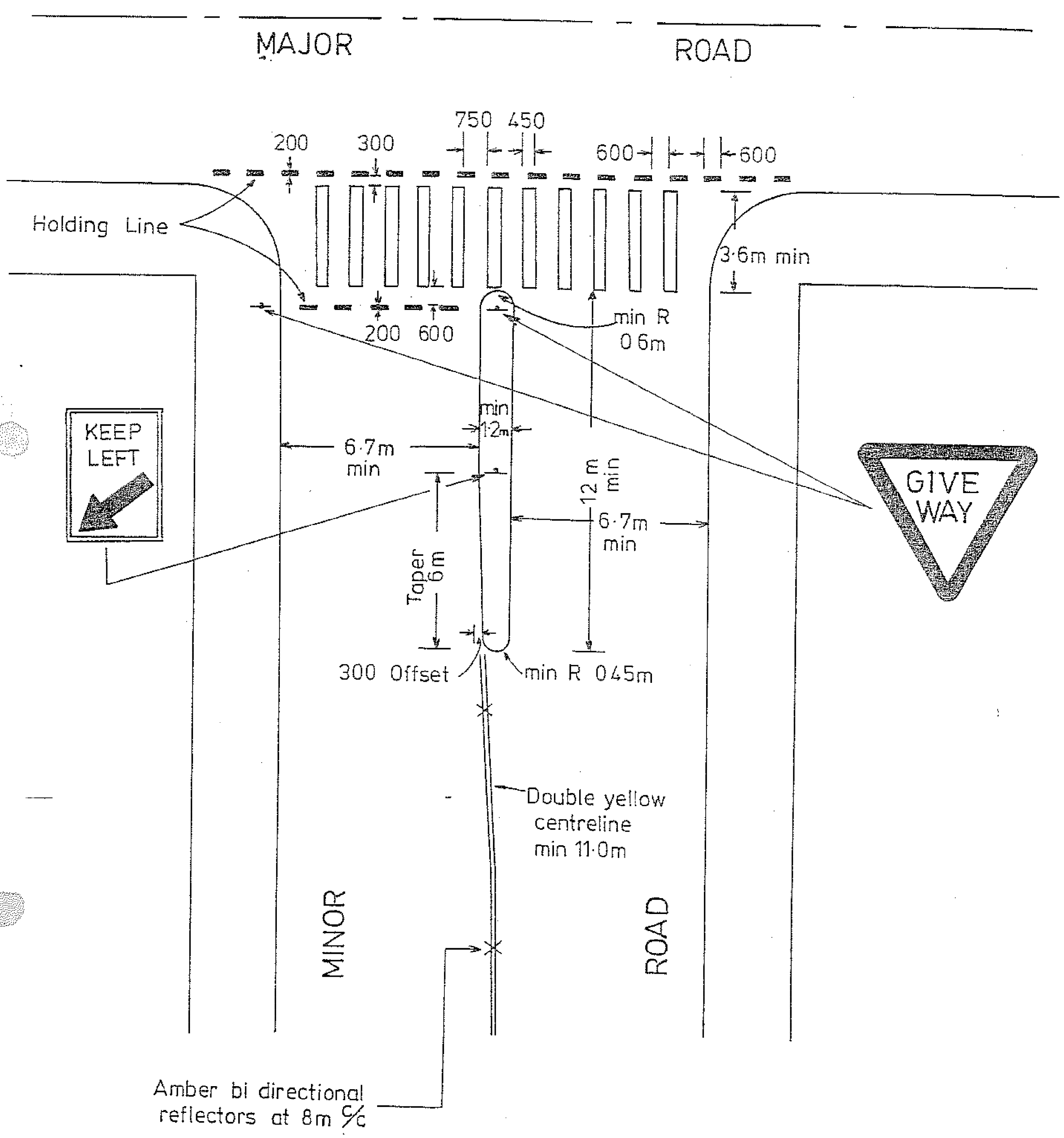


3·5m FOOTPATH

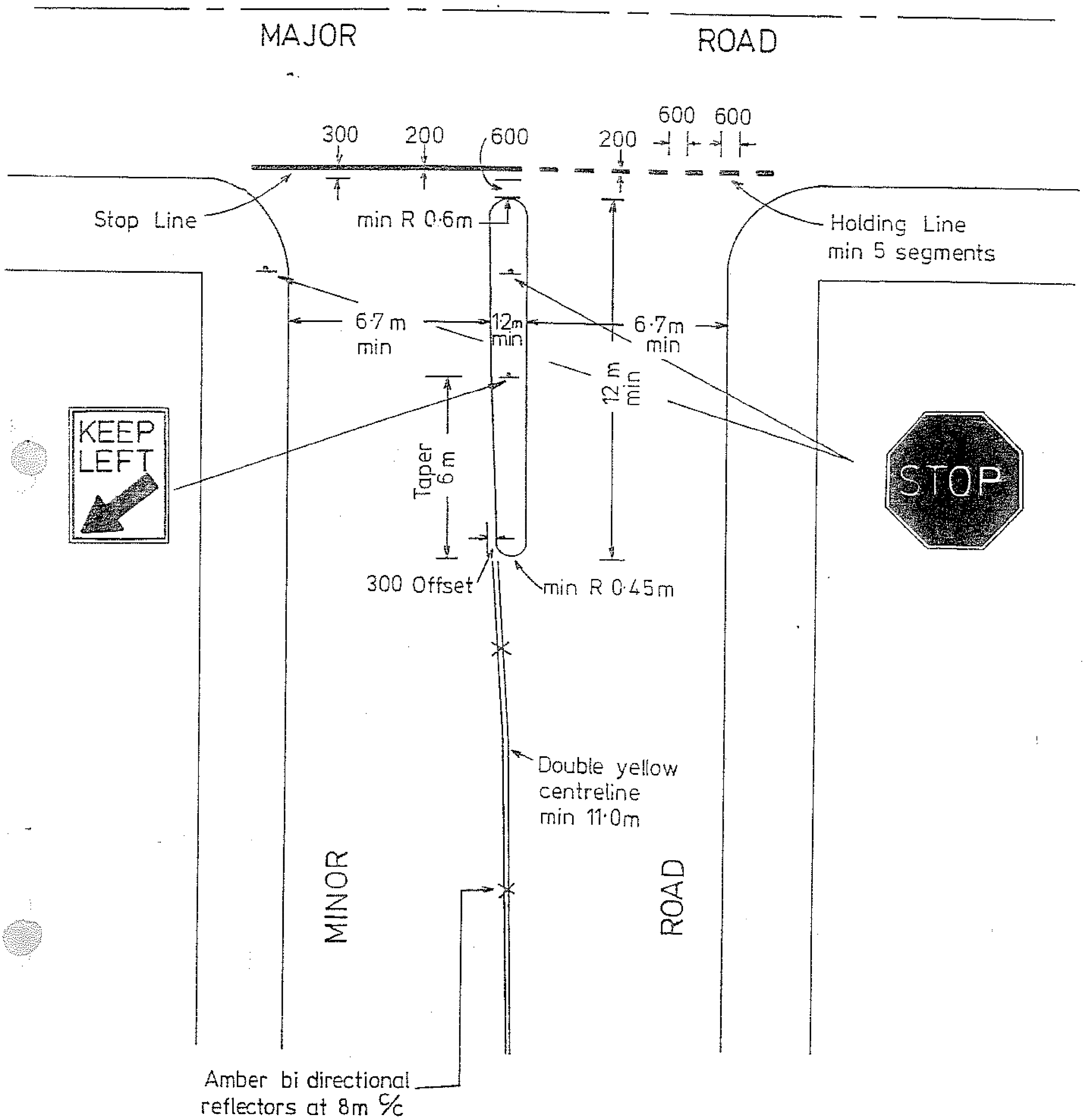
M Miscellaneous
E Electricity
G Gas
T Telecom
S Special services
W Water mains
D Drainage
P Poles & trees

NOTE: Cycleways only on 5·5m footpaths

CESSNOCK CITY COUNCIL	DRAWN C.D. DATE 3·10·84	SD 5
STANDARD FOOTPATH SERVICE ALLOCATIONS	APPROVED 1/11/84	



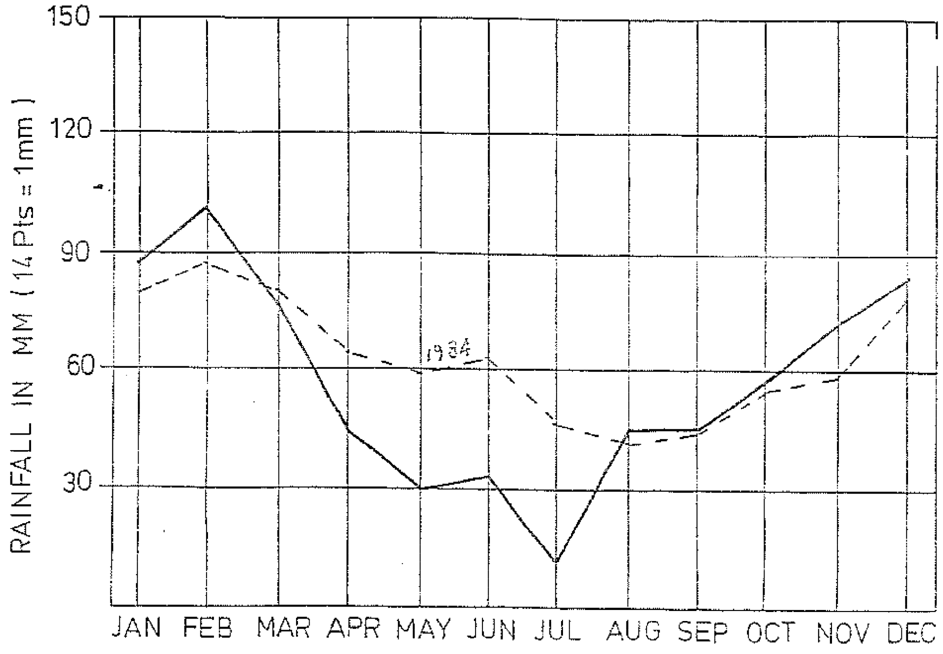
CESSNOCK CITY COUNCIL	DRAWN C·D·	DATE 20·6·84	SD 7
TYPICAL TRAFFIC ISLAND LAYOUT FOR SIDE ROAD WITH GIVE WAY SIGN AND PEDESTRIAN CROSSING	APPROVED		



CESSNOCK CITY COUNCIL

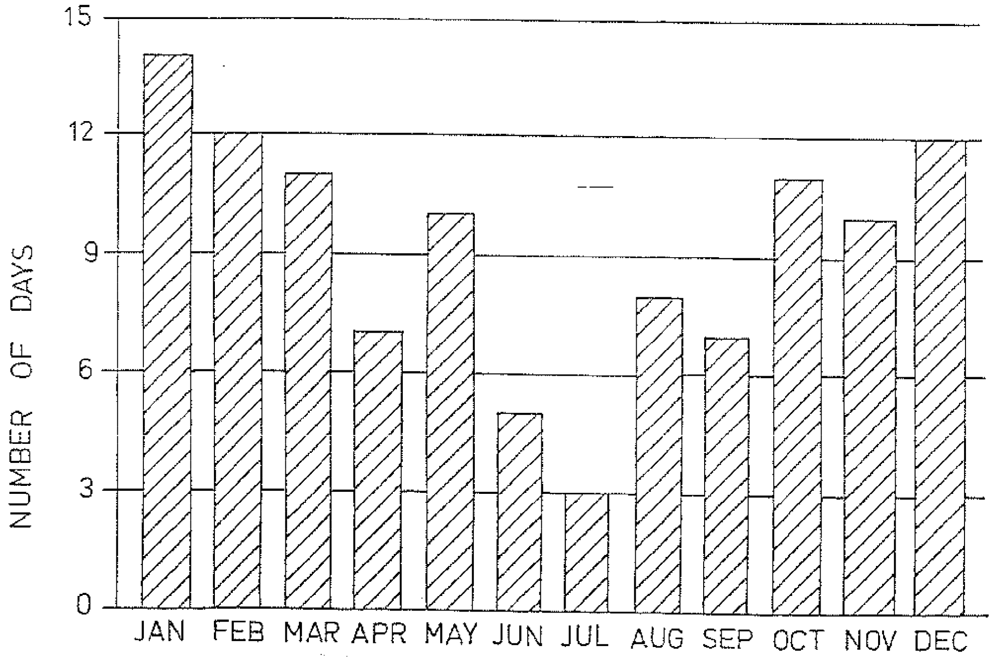
TYPICAL TRAFFIC ISLAND LAYOUT FOR SIDE ROAD WITH STOP SIGN

DRAWN	DATE	
C·D·	20·6·84	**SD 8**
APPROVED	1/7/84	



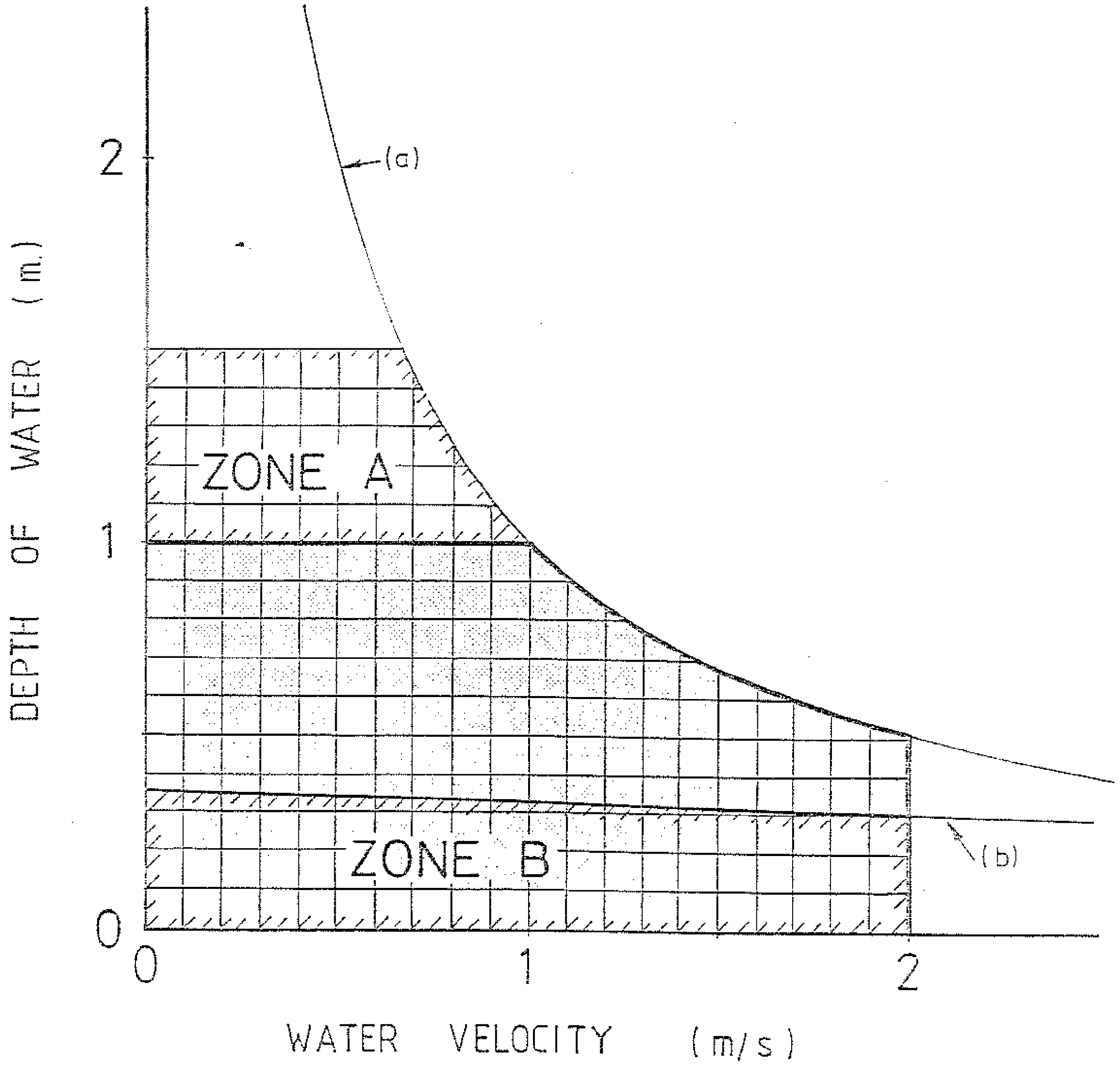
AVERAGE MONTHLY RAINFALL

AAR 1984 750mm



AVERAGE NUMBER OF WET DAYS PER MONTH

THE GREATER CESSNOCK CITY COUNCIL RAINFALL DATA	NOT TO SCALE
James B Croft & Associates.	SD 9

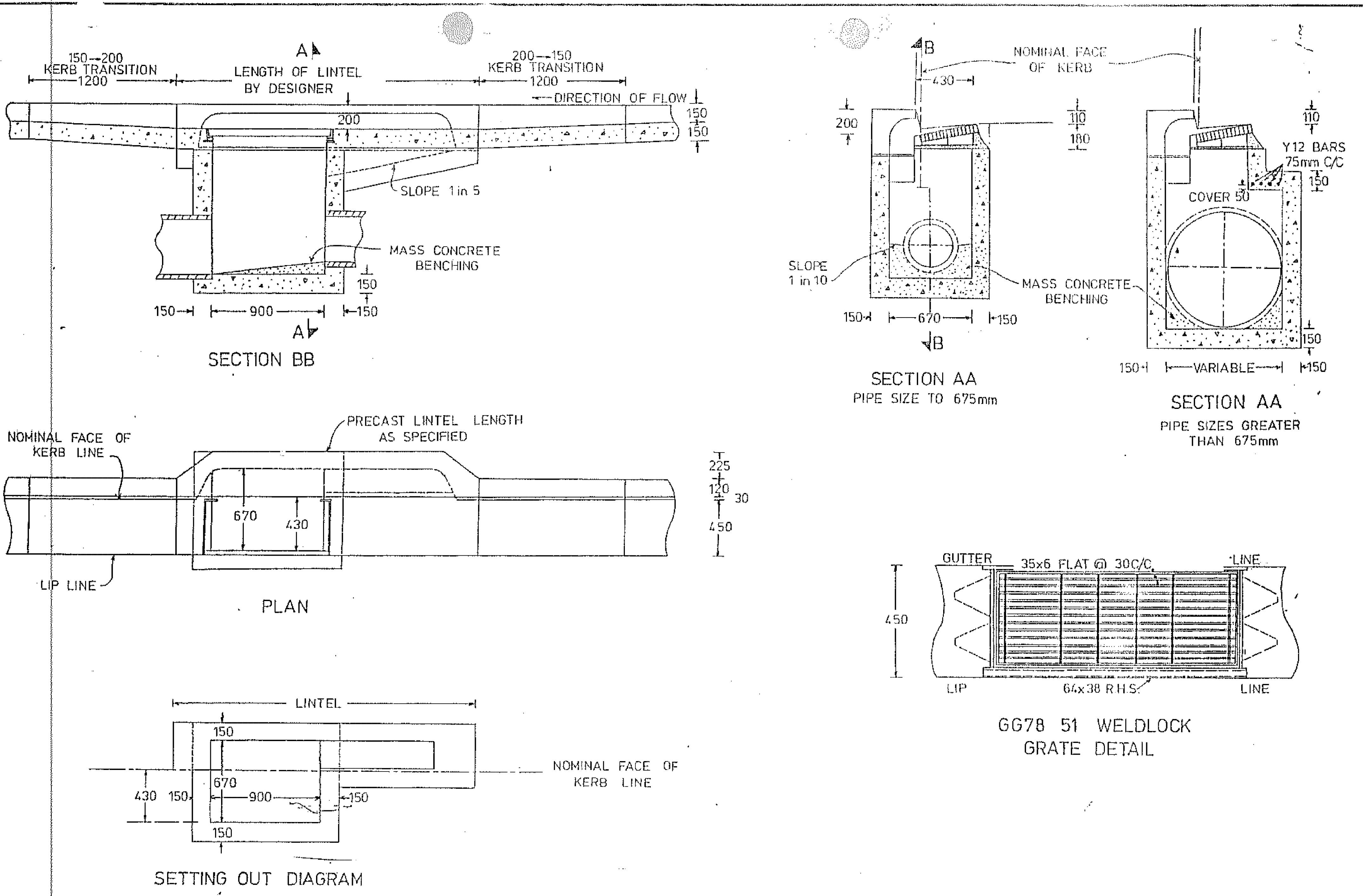


NOTE: 1. All open drainage structures are to have a water velocity - depth relationship within the shaded area. Exceptional cases may be allowed within Zone A.

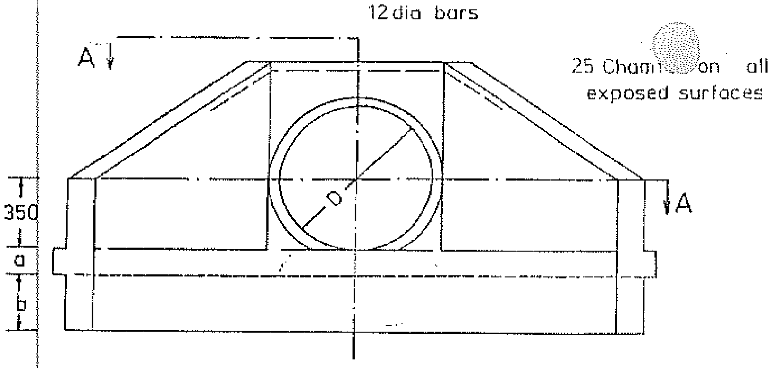
2. Causeways and spillways are to have a water velocity - depth relationship within Zone B.

Ref. (a) Limiting criteria for light housing & safety, Velocity x depth = 1 m^2/s.
(U.S. Corps of Engineers, U.S.A.)
(b) Approximate limit for safety of light vehicles on causeways.
(Water Research Laboratory Report Nº 100 - "Low Level Causeways"
A.J. Bonham & R.T. Hattersley, - Aug. 1967)

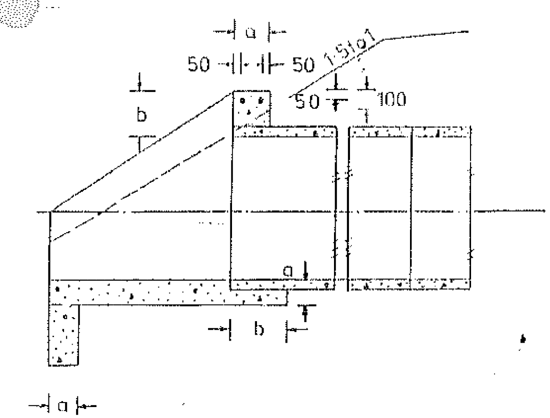
CESSNOCK CITY COUNCIL	Approved:	Scale:
SAFETY LIMITS FOR DESIGN OF FLOOD STRUCTURES.	Date: 1-7-84	SD 10



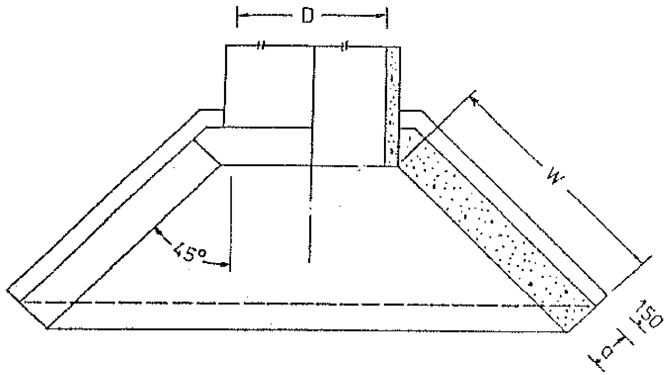
CESSNOCK CITY COUNCIL	APPROVED	DATE	DRAWN	DATE	SD 11
STANDARD EKI GULLY PIT MODIFIED LANDCOM LD12 TO	[signature]	1/6/84	C DAVIS	18·5·84	
			SCALE		



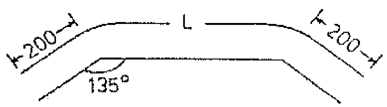
ELEVATION



LONGITUDINAL SECTION



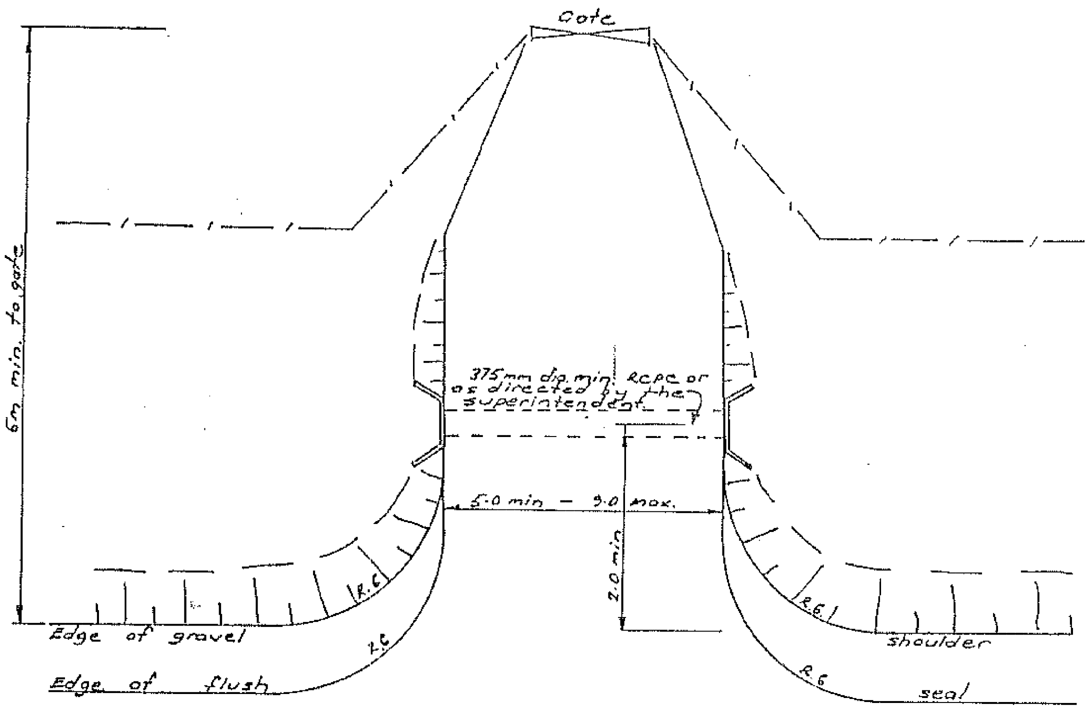
PLAN SECTION AA



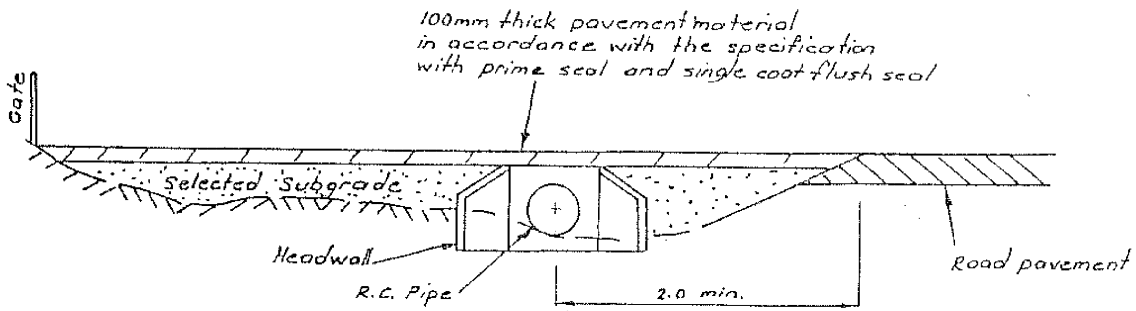
Y12 dia bars
2 required each headwall

D Pipe Diameter		(mm)	375	450	525	600	675	750	825	900
a		(mm)	150	150	150	180	200	210	220	230
b		(mm)	200	200	200	300	300	300	300	300
W		(mm)	690	840	990	1120	1320	1450	1620	1780
L		(mm)	850	900	1000	1100	1200	1250	1350	1400
Reinforcement dia		(mm)	12	12	12	12	12	12	12	12
Reinforcement in two headwalls	Length	(mm)	3400	3600	4000	4400	4800	5000	5400	5600
	Mass	(kg)	3·1	3·3	3·6	4·0	4·4	4·6	4·9	5·1
		(m^3)	0·68	0·88	1·10	1·73	2·23	2·94	3·28	4·37

CESSNOCK CITY COUNCIL CONCRETE HEADWALLS FOR 375 TO 900 DIAMETER PIPES	APPROVED [signature]	DATE 1/6/84	DRAWN C. DAVIS	DATE 25·5·84	SD 12



PLAN



TYPICAL CROSS SECTION

ACCESS SPECIFICATION

1) Access width 5·0m. min. to 9·0m. max. as directed by the superintendent.

2) Batter slopes – cut & fill heights <1m – 5:1
≥1m – 2:1

3) The superintendent shall determine whether an RCP culvert is required.

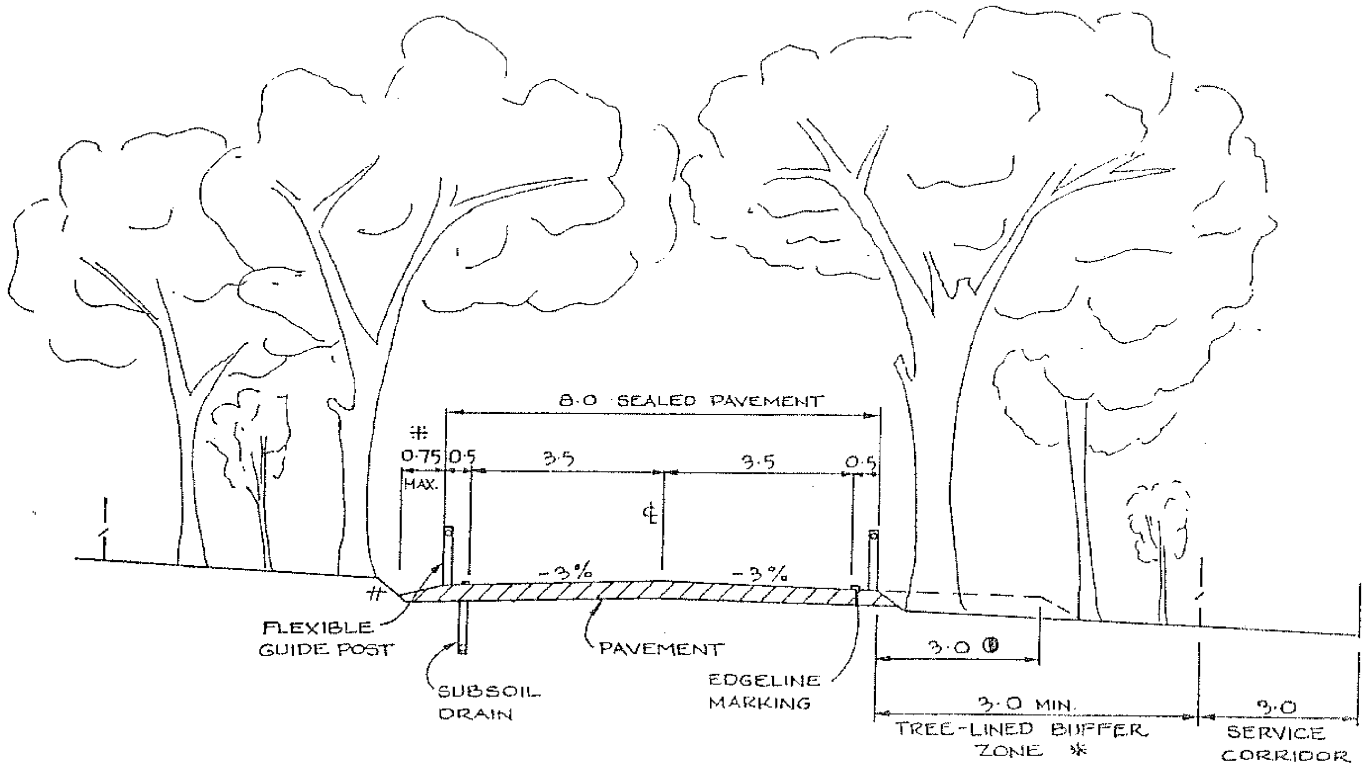
4) Seal width — 5·0m.

5) Max. seal length – to the gate or 10m. whichever is the lesser.

6) Seal – prime 5mm agg.
flush 14mm agg.

SD 13

PLAN Nº.	CESSNOCK CITY COUNCIL
MR 93A	RURAL PROPERTY ACCESS



NOTES :

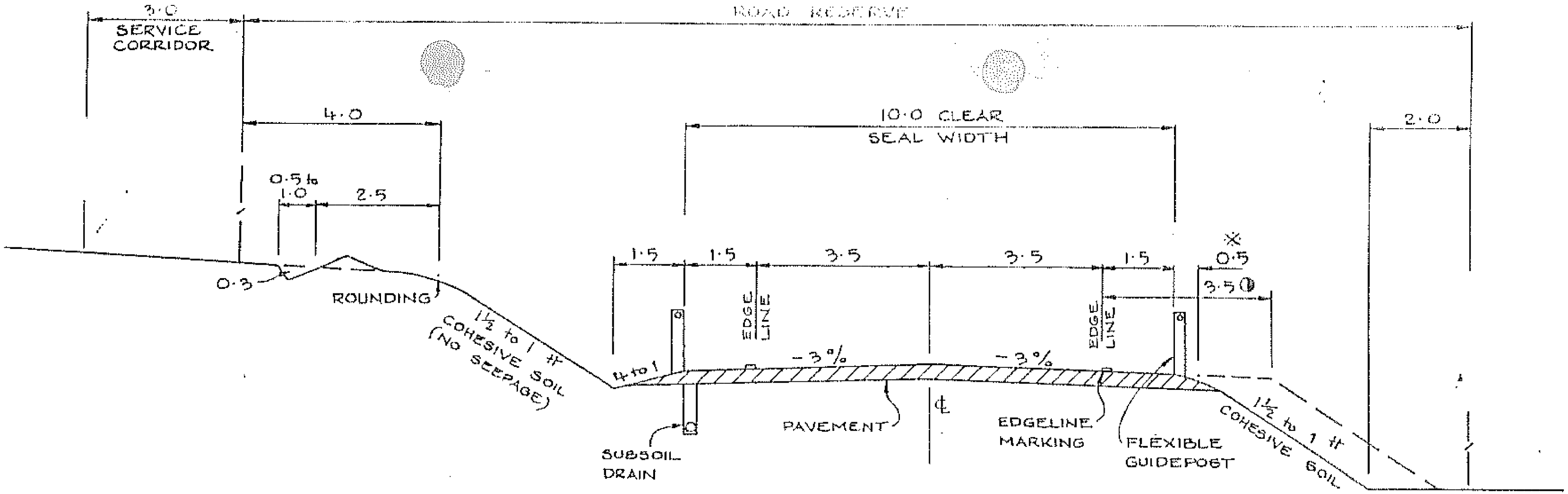
TABLE DRAIN 0.75 MAX.
TO BE SEALED

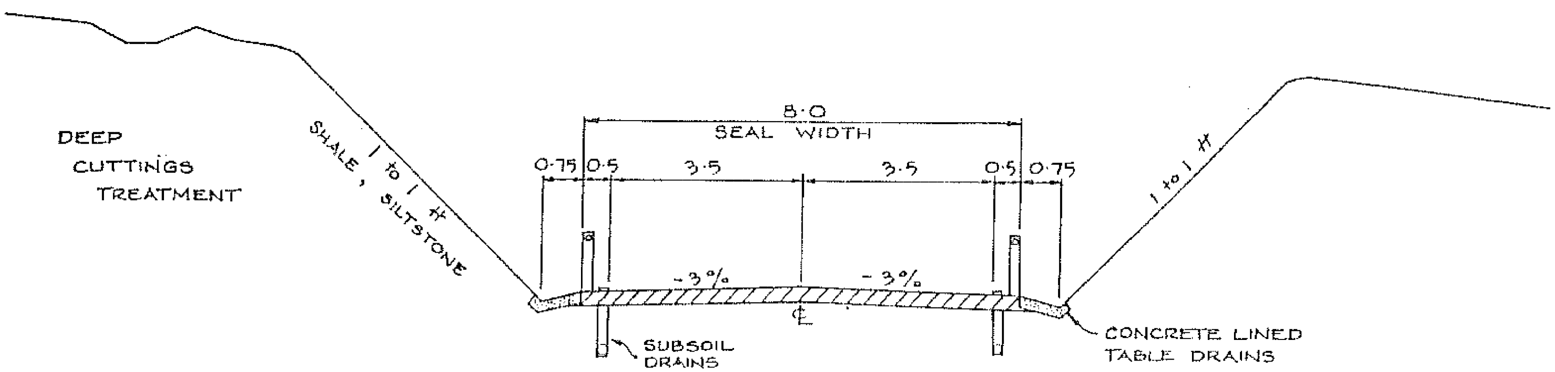
ⓘ PROVIDE LAYBYS AT APPROX. 500m INTERVALS ON ALTERNATE ROADSIDE : 15m APPROACH TAPER
10m PARKING
5m DEPARTURE TAPER

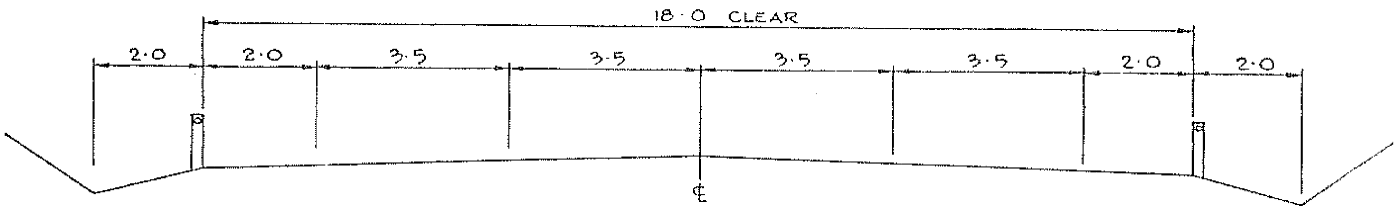
IN DEEP CUTTINGS BATTER SLOPES SHOULD BE 1:1 IN SHALE/SILTSTONE OR AS SPECIFIED IN RTA FORM 70

* TO BE UTILIZED FOR AUXILIARY TURNING LANES AT INTERSECTIONS

CESSNOCK CITY COUNCIL	DRAWN DATE	SD 14
TYPICAL CROSS-SECTION	C.S. 8-3-89	
TREE-LINED TOURIST ROAD	10/3/89	







NAASRA TYPE C INTERSECTION

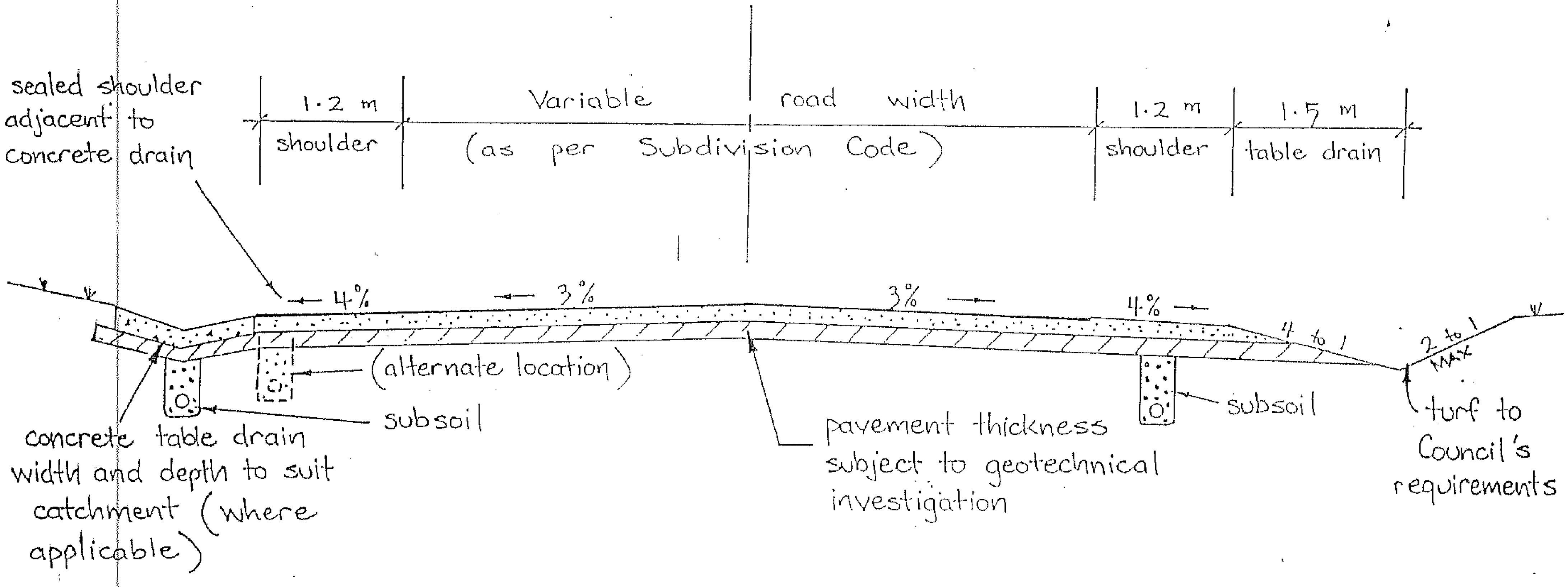
NOTES:

◐ PROVIDE LAYBYS AT APPROX. 500m INTERVALS ON ALTERNATING SIDES : 30m APPROACH TAPER
20m PARKING
10m DEPARTURE TAPER

BATTERS ARE VARIABLE DEPENDENT ON SOIL TYPES (SEE RTA FORM 70)

※ VERGE WIDTH 1·0m AT GUARDFENCE

CESSNOCK CITY COUNCIL	DRAWN DATE	SD 15
STANDARD CROSS-SECTION RURAL SUB-ARTERIAL OR MAJOR COLLECTOR ROADS WITH TRAFFIC GREATER THAN 1000 VPD	C.S. 8-3-89 [signature] 10/3/89	



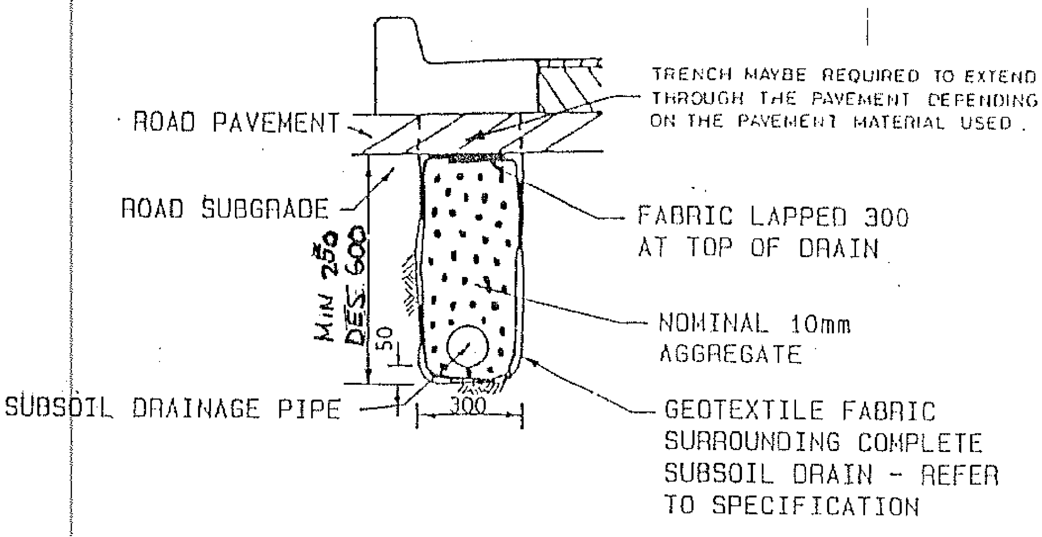
CESSNOCK CITY COUNCIL

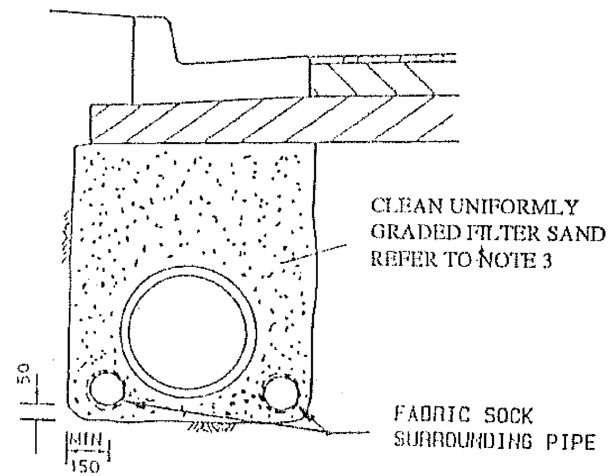
RURAL SUBDIVISION

TYPICAL ROAD SECTION

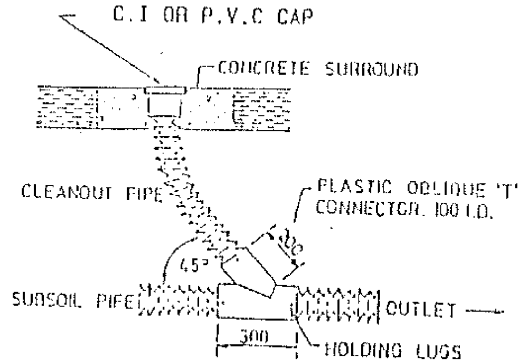
DRAWN	DATE
C.S.	8-3-89
[signature]	10/3/89

SD 16





SUBSOIL PIPE IN STORMWATER DRAINAGE TRENCH



ELEVATION OF CLEANOUT

1. SUBSOIL DRAINAGE FILTER DESIGN SHALL BE DESIGNED IN ACCORDANCE A.R.R.B. NOMINAL SIZE AGGREGATE (10mm MAXIMUM) IS TO BE USED FOR THE FILTER IN THE TYPE 1 DRAIN WHEN THE ABOVE DESIGN METHOD SHOWS THAT THE AGGREGATE IS COMPATIBLE WITH THE INSITU MATERIAL. THE FABRIC SOCK CAN BE OMITTED UNDER THESE CIRCUMSTANCES.
2. TYPE, LOCATION AND EXTENT OF SUB SOIL DRAINAGE WILL DIFFER DEPENDING ON PAVEMENT MATERIALS TO BE USED. PRIOR ADVICE SHOULD BE SOUGHT FROM COUNCIL.
3. A NOMINAL SIZE AGGREGATE (10mm MAXIMUM) IS TO BE USED FOR THE FILTER IN THE TYPE 1 DRAIN WHEN THE ABOVE DESIGN METHOD SHOWS THAT THE AGGREGATE IS COMPATIBLE WITH THE INSITU MATERIAL. THE FABRIC SOCK CAN BE OMITTED UNDER THESE CIRCUMSTANCES.
4. LOCATION OF SUBSOIL DRAINS TO BE DETERMINED ON SITE PRIOR TO COMMENCEMENT OF CONSTRUCTION.
5. THE LOCATION OF SUBSOIL DRAINAGE LINES IS TO BE IN ACCORDANCE WITH A.R.R.B. 41 GIVEN THE SUBBASE AND BASE MATERIALS ARE SATISFACTORY.

~~6. Ma. Sr. Part ?~~ ?)

SUBSOIL DRAIN DETAIL

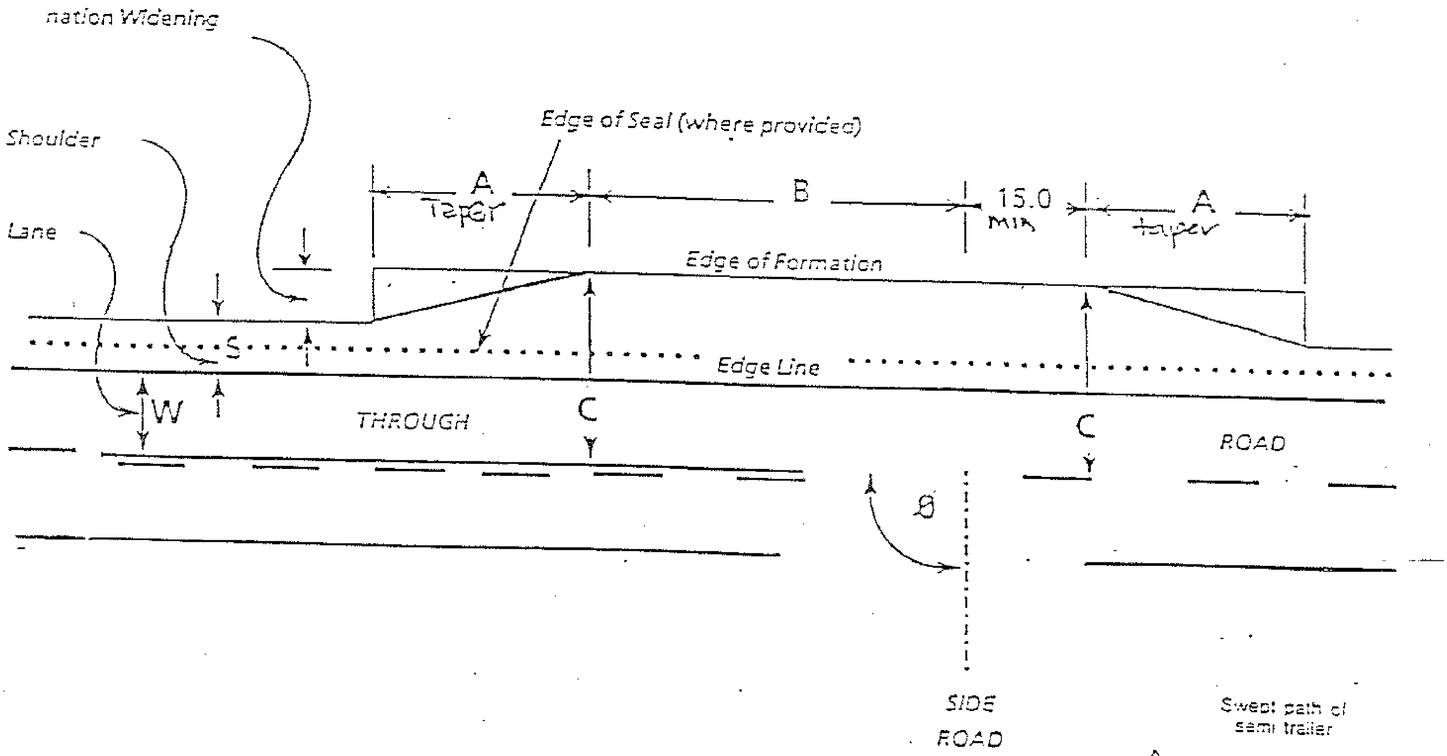
Approved By	Date	Datum	Sheet No	Plan No
[signature]	4.12.94		1	S.D 17

RIGHT TURN TREATMENT FOR RURAL ROAD CONDITIONS TO COMPLY WITH AUSTROADS STANDARD TYPE A.

PREPARED BY:- Road Safety Manager,
Cessnock City Council
Revised January 1993.

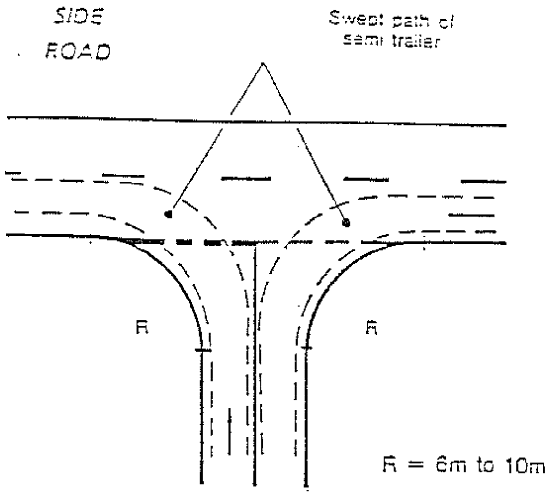
BASIC RIGHT TURN - MINIMUM TREATMENT

This is the minimum treatment for right turn movements from a through road to side roads and local access points. This treatment provides sufficient trafficable width for a heavy vehicle (17.5m long) to pass at a substantially reduced speed on the left of a stationary vehicle turning right.



Formation widening = C-W-S

A_T - $\frac{0.5 \times \text{Speed (km/h)} \times \text{formation widening}}{3.6}$



B - 28m @ 60kph

B - 39m @ 80kph

B - 42m @ 100kph

W - 3.0m (min) to 3.5m

S - 1.0m (min) to 3.0m (adjacent to barrier line)

C - (min on straight) = 6.0m

C - (min on curve) = 2 x 3.0 lane + corresponding widening for curve radius

Ø - (min angle 70°)

Ø - (max angle 110°)

Should the through road be sealed, then the passing lane will be required to be sealed.