

SCHEDULE "A"

THE VILLAGE OF PORT CLEMENTS
SUBDIVISION SERVICING BYLAW NO. 195

SCHEDULE A

Design Criteria, Specifications and Standard Drawings

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VILLAGE OF PORT CLEMENTS

SUBDIVISION SERVICING BYLAW NO. 195

SCHEDULE "A"

1.0 GENERAL INFORMATION

1.1 INTRODUCTION

Schedule 'A' to the Subdivision Servicing Bylaw identifies the Design Criteria, Specifications, and Standard Drawings acceptable to the Municipality.

This Schedule is to be referred to in the design, construction and acceptance of Engineering Works within the Municipality. Additional information, clarification and suggestions for changes and amendments should be directed to:

Village of Port Clements
P.O. Box 198
Port Clements, BC
V0T 1R0

1.2 DEFINITIONS

In this Schedule, unless the context otherwise specifies:

"ACCEPTED" means as accepted by the Approving Officer or Building Inspector employed by the Municipality.

"CONSIDERED" means considered for acceptance by the Approving Officer or Building Inspector.

"CONTRACTOR" means the person or persons or the company undertaking the construction of works in a subdivision development, and/or on municipal property, or their employees, subcontractors or other duly authorized representative.

"DEVELOPER" means the owner of land or the holder of a bona-fide interim agreement or option to purchase land, who has made application to the Municipality for or is engaged in undertaking the development or subdivision of such land and shall include his duly authorized representative.

"DEVELOPER'S ENGINEER" means the Professional Engineer engaged by the Developer to design and/or prepare drawings for the construction of works in a subdivision, development, and/or on municipal property, or his duly authorized representative.

"ENGINEER" means the Municipal Engineer of the Village of Port Clements or a duly authorized representative of the Municipality.

"MUNICIPALITY" means the Village of Port Clements.

"PROFESSIONAL ENGINEER" means a person who is registered or duly licensed as such in British Columbia under the provision of the Engineer's Professional Act.

"THIS SCHEDULE" means the "Design Criteria, Specifications and Standard Drawings" prepared by the Village of Port Clements.

"THE WORK" means and includes anything and everything to be done for the setting out, the execution and fulfillment of the requirements in this Schedule.

1.3 SCOPE AND USE

This schedule shall be taken to mean the Design Criteria, Specifications and Standard Drawings to be referred to, and incorporated in, subdivisions, developments, and on municipal properties or rights-of-way, in the Village of Port Clements.

1.4 NON-MUNICIPAL CODES AND STANDARDS

Where non-Municipal codes and standards, such as A.S.T.M., C.S.A., A.W.W.A., etc., are referred to in this Schedule, the latest adopted revision, including amendments, of these codes and standards at the date of commencement of construction shall apply, except that the Approving Officer may vary requirements under certain circumstances in the interest of public health or safety.

When references to the following capitalized abbreviations are made, they refer to Specifications, Standards, or Methods of the respective Association.

AASHTO	American Association of State Highway and Transportation Officials
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
BCBC	British Columbia Building Code
CEC	Canadian Electrical Code
CEMA	Canadian Electrical Manufacturers Association
CGSB	Canadian General Standards Board
CSA	Canadian Standards Association
CSPI	Corrugated Steel Pipe Institute
IES	Illumination Engineering Society
LEMA	Lighting Equipment Manufacturers Association
NBC	National Building Code of Canada
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NESC	National Electric Safety Code
NFPA	National Fire Protection Association
RTAC	Road and Transportation Association of Canada
WCB	Workers' Compensation Board

2.0 ROAD AND WALKWAYS

2.1 INTRODUCTION

All roads in the Municipality shall be designed in accordance with the recommended practice as outlined in "Geometric Design Standards for Canadian Roads and Streets", as published by the Canadian Roads and Transportation Association (R.T.A.C.) or as stated elsewhere in this Schedule or as accepted.

2.2 BASIC ROAD AND WALKWAYS CLASSIFICATIONS

Roadway classification throughout the Municipality shall be as indicated in this Bylaw. All roads built within the village shall be either to an arterial, local or collector standard as defined in this section. The local and collector roads are minor roads built to a rural standard. The distinction between arterial, local and collector roads shall be at the discretion of the Approving Officer.

Arterial Street (standard drawing R-6)

Arterials are intended to carry large volumes of all types of traffic moving at medium, to high speeds. Controlled access to adjacent properties will be permitted, however direct access to single family development will not generally be allowed. Average daily traffic (ADT) volumes generally range from 5,000 - 30,000 vehicles. Arterial streets are normally characterized by trip lengths exceeding 1.5 km.

Local Road (standard drawing R-7)

The main function of a minor local street is to provide land access. Direct access is allowed to all abutting properties. Local streets are not intended to move large volumes of traffic. Minor local streets shall not exceed 150 m in length unless accepted.

Collector Street (standard drawing R-8)

Collector streets provide both traffic service and land service functions. The traffic service function of this type of street is to carry traffic between local and arterial streets. Controlled access to adjacent properties will be allowed on collectors. Trip lengths are commonly in the range of 0.75 - 1.5 km. Average daily traffic (ADT) volumes generally range from 1,000 - 12,000 vehicles.

Cul-de-Sacs and P-Loops (standard drawing R-1-A)

Cul-de-sacs and P-Loops shall be classified as minor local streets and shall not exceed a length of 120 m unless accepted.

Lanes (standard drawing R-12)

Lanes provide service access to commercial areas or as an extension of any existing system of lanes. Lanes shall not exceed a length of 150 m unless accepted. Dead-end lanes shall not be encouraged, but, when accepted, shall include a turn-around area.

Walkways (standard drawing R-10)

Functional walkways provide pedestrian access to transit, shopping and school sites. Leisure walkways provide pedestrian access to parks and open public areas.

2.2.1 OPTIONAL ROAD CLASSIFICATIONS

Upon agreement between the developer and the Approving Officer, the developer shall be allowed to build roads to the following standards.

Minor Local Road - Urban (standard drawing R-1)

The definition of a minor local road - urban is the same as for a local road in section 2.2. For construction purposes, a minor local road - urban does not require 2 m shoulders.

Major Local Road - Urban (standard drawing R-2)

The main function of a major local road - urban is to provide land access. Direct access is allowed to all abutting properties. Local streets are not intended to move large volumes of traffic. Trip lengths are short, generally under 0.75 km in length.

A major local road -urban requires construction of a 1.2 m sidewalk.

Collector Road, Urban (standard drawing R-3)

The definition of a collector road - urban is the same as for a collector road in section 2.2. For construction purposes, a collector road - urban does not require 2 m shoulders but does contain the requirement for a 1.7 m sidewalk.

Minor Commercial Road (standard drawing R-4)

Commercial streets provide vehicle and pedestrian access to and through commercial shopping areas. Pedestrian volume and vehicle parking volume are greater than on residential streets.

Major Commercial Road (standard drawing R-5)

The definition of a major commercial road is the same as for a minor commercial road. For construction purposes, the difference is that a the paved portion of a major commercial road must be 16 m wide, as compared to 13.5 m of pavement for a minor commercial road.

2.3 DESIGN PARAMETERS

2.3.1 Design Speed

Unless otherwise specified, roadways shall be designed to the following minimum standards as specified in the Roads and Transportation Association of Canada Geometric Design Standards for Canadian Roads and Streets Manual:

Arterials	70 km/hr.
Locals	50 km/hr.
Collectors	60 km/hr.

2.3.2 Cross Section Elements

All right-of-way and roadway widths shall be as outlined in Table 2.3.2 Right-of-way and Roadway Widths.

Table 2.3.2 - Right-of-Way and Roadway Widths

<u>Road Classification</u>	<u>Minimum Right-of-Way Width</u>	<u>Minimum Roadway</u>
Arterials:		
Controlled by the BC Ministry of Transportation and Highways	As per BC M.O.T.H. Requirements	As per BC M.O.T.H. Requirements
Local Street (standard drawing R-7):	20.0 m	6.0 m, 2 m shoulders
Collector (standard drawing R-8):	20.0 m	7.5 m, 2 m shoulders
Col-de-Sac (standard drawing R-1-A)	20.0 m (15.0 m bulb)	6.0 m paved c/c (8.5 m bulb)
Lane (standard drawing R-12):	4.80m	4.4 m granular
Walkways (standard drawing R-10):		
Leisure	3.0 m	1.5 m granular
Functional	3.0 m	1.5 m paved

Where an 8 metre roadway width cannot be adequately supported, protected or drained within a 20 metre highway right-of-way width because of terrain and soil conditions, land of a greater width may be required to be provided so an 8 metre roadway may be adequately supported, protected or drained. In accordance with the bylaw, all work on highway right-of-way is to be completed before the subdivision is approved unless an arrangement pursuant to Section 6.0 of the bylaw is made.

For details of cross-sectional elements refer to the standard drawings.

Roll-over curbs will be permitted only on local roads and only where the adjoining land use is designated as single family residential.

2.3.3 Horizontal Alignment

Curvature

Table 2.3.3.1 illustrates the minimum required centreline radius for various superelevation rates for each classification of roadway. All designs to be in accordance with RTAC Standards.

Table 2.3.3.1 - Minimum Horizontal curve Radii (Metres)

Roadway Classification	Horizontal Curve Radii No Superelevation (m/m)			
	Superelevation	0.02	0.04	0.06
Arterial				
MOTM	MOTM Standards	MOTM Standards		
Municipal	RTAC Standards	1500	500	130
Collector	120	110	100	-
Local	65	-	-	-

Spiral transition curves and superelevation will be required for arterial roadway designs while collector and local streets may be designed using simple curves.

The maximum superelevation rate for arterials shall be 0.06 m/m and for collectors shall be 0.04 m/m. No superelevation will be permitted on local streets.

Table 2.3.3.2 illustrates the minimum curb or pavement return radius for various roadway classifications.

Table 2.3.3.2 - Curb Return Radii

Road Classification	Return Radii (metres)
Arterial	9
Collector	8
Local	8
Cul-de-Sac	6

Cul-de-sac bulb radius for paved or gravelled surface shall be a minimum of 8.5 m.

All roadways shall be constructed using a 2% centreline crown except under adverse topographic conditions, offset crowns may be permitted for local or collector streets at the discretion of the Approving Officer, in which case the location of the crown shall be approximately 2.5 metres from high side curb with a minimum cross slope of 2% and a maximum of 4%.

Overall curb-to-curb crossfalls will not be permitted except in cases where superelevation is required.

Lanes shall be constructed using an inverted 2% crown.

2.3.4 Vertical Alignment

Roadway Grades

Minimum grades for urban and rural roadways shall be 0.50 percent with 2% crossfall or 0.30% with 3% crossfall*.

* Special approval required.

Curb return grades shall be minimum 1.0%

Table 2.3.4.1 - Maximum Roadway Grades

The maximum roadway grade for all designations shall be 8%. Consideration may be given to allowing increased grades where short sections of steeper grades can be utilized to improve the geometric design of intersections for increased safety.

Vertical Curvature

Vertical curves shall be designed to provide safe stopping sight distances and shall be provided where centreline grades change is in excess of 1%. Stopping sight distance is the distance separating a vehicle from an object, measured the instant that an object (for which the driver decides to stop) comes into view. Minimum stopping sight distance is the least distance required to bring the vehicle to a stop, under prevailing vehicle and climatic conditions. Vertical curve length is calculated by the equation $L = KA$:

Where: L = length of the vertical curve
 K = a constant related to lines and geometry of a parabolic curve
 A = algebraic difference in grades in percent

Table 2.3.4.2. shows the minimum K values to be used for vertical curve design.

All vertical curves are to be symmetrical.

Table 2.3.4.2. - Minimum K Values (metres) for Vertical Curve Design

Roadway Classification	Crest Curve		Sag Curve	
	Minimum	Desirable	With Street Lighting	Without Street Lighting
Arterial - RTAC - M.O.T.H. Requirements				
Local	7	10	6	9
Collector	10	15	9	20

Vertical Alignment

The vertical alignment of roads shall be such that an access driveway having a maximum 10% grade can be achieved from the property line to the proposed building area.

2.3.5 Intersections

Unless indicated elsewhere herein, all intersection design standards shall conform to those outlined in the "Geometric Design Standards for Canadian Roads and Streets" as published by Roads and Transportation Association of Canada.

Intersection Grades

Approach grades of minor roads at intersections to major streets shall not exceed 75% of the maximum allowable road grade for that street classification.

Consideration may be given to increased approach grades where topographic or other conditions dictate the use of maximum or near maximum grades.

Intersection Vertical Curves

The minimum K values for vertical curves on minor roads at intersection shall be as shown in Table 2.3.5.

Table 2.3.5 - Minimum Intersection K Values

Minor Intersecting Street	Minimum K Value, Metres	
	Crest Curve	Sag Curve
Local	4	4
Collector	7	6

Grades of major roads through intersecting minor approaches shall be constant and shall not exceed 75% of the maximum allowable grade for that street classification. Consideration may be given to allowing increased grades where topographic or other conditions dictate the use of maximum or near maximum grades.

2.3.6 Road Base

Minimum road base requirements shall be as outlined in Table 2.3.6.1.

Table 2.3.6.1 - Pavement Structure Requirements

Road Classification	Sub-base Thickness	Base Thickness	Surface Material and Thickness
Arterial	+ 400 mm	75 mm	100 mm asphalt
Local:			
Residential	+ 300 mm	75 mm	50 mm asphalt
Commercial	+ 300 mm	75 mm	50 mm asphalt
Industrial	+ 400 mm	75 mm	75 mm asphalt
Collector (All zones)	+ 400 mm	75 mm	75 mm asphalt
Cal-de-sac	+ 300 mm	75 mm	50 mm asphalt
Lane	+ 300 mm	75 mm	50 mm granular

Pavement structure requirements refer to both rural and urban road classifications.

- * Increases in sub-base thickness where poor soil conditions exist shall be at the discretion of the Approving Officer. Pavement structure requirements shall be confirmed by the Developer's Engineer following completion of a geotechnical investigation.

Where a "half-road" is to be installed, the asphalt thickness for all road classifications shall be a minimum of 75 mm with 45 mm to be installed during initial construction and the 30 mm remaining thickness to be installed when the roadway is completed.

2.3.7 Sidewalks and Walkways

Sidewalks shall be installed in accordance with the minimum requirements outlined in Table 2.3.7.

Table 2.3.7 - Minimum Sidewalk Requirements and Widths and Curb Types

<u>Road Classification</u>	<u>Requirement</u>	<u>Width</u>	<u>Curb Type</u>
Arterial	Both Sides	1.5 m	non-mountable
Local	* One Side	1.5 m	varies
Collector	* One Side	1.5 m	non-mountable
Cul-de-sac	N/A	N/A	varies

- * Additional sidewalk shall be installed in areas deemed necessary by the Approving Officer. Such cases shall include areas with multi-family, institutional and commercial development and proposed bus routes.

Where a walkway exists on a cul-de-sac, a sidewalk, 1.5 m wide, shall be extended to the walkway entrance.

Sidewalks shall not be required for rural roads.

Sidewalks shall at all times drain towards the gutter with a cross slope of 2%.

Wheelchair ramps shall be installed at all intersections and at crosswalks.

Where non-mountable curbing is used, access to properties shall be in the form of sidewalk crossings and shall conform to municipal standards. Breaks in a sidewalk and use of curb returns for access will not be permitted. Widths for crossings may vary depending on the development's requirements. Minimum crossing width for residential driveways shall be 6.0 m. Maximum crossing width for industrial and commercial driveways shall be 10.0 m.

Where mountable curbing is used, sidewalk crossings will not be required and access shall be directly over the sidewalk. Transition from mountable to non-mountable curbing shall in all cases be made at the nearest wheelchair ramp.

Where a barrier curb leads to a roll over curb, the construction of a transition curb will be required.

Sidewalk crossings for private residential driveways shall be 150 mm thick. Sidewalk crossings for lanes, industrial, commercial or multiple dwelling developments shall be 180 mm thick. Curing compound and sealing compound shall be applied according to the manufacturer's recommendations.

Sidewalks and walkways shall be designed to provide an overall pedestrian traffic system throughout the areas and locations shall be subject to the acceptance of the Approving Officer.

Pedestrian walkway patterns in newly developed areas shall be designed on the basis of functional and leisure usage and shall be subject to the acceptance of the Approving Officer.

Functional walkways for pedestrian access to transit, shopping and school sites shall be constructed to Municipal specifications to a full 1.5 m width with a minimum of 100 mm pit-run gravel base and surfaced with a minimum of 50 mm asphaltic concrete or a minimum of 100 mm of concrete.

Leisure walkways for pedestrian access to and in parks and open public areas shall be constructed to Municipal specifications to a full 1.5 m width with a minimum of 100 mm pit-run gravel base and surfaced with a minimum of 50 mm compacted crushed shale or gravel.

(Fencing of walkways shall be the responsibility of the adjacent property owners who will ensure that construction of such is carried out in accordance with Municipal standards.)

Where walkway grades exceed 9% but are less than 12%, an accepted stepped walkway shall be constructed.

Where walkway grades exceed 12%, accepted steps shall be constructed. All walkways concrete with steeper than 10% grades shall be provided with an accepted handrail.

Walkways shall be graded and constructed to the full width between property lines to provide proper access and drainage.

2.3.8 Boulevards and Restoration

Unless otherwise accepted, all boulevards shall be graded to drain to the curb or ditch, as applicable, at a minimum slope of 2% and a maximum slope of 10 %.

The top 100 mm of soil shall be good quality topsoil raked free of any debris which is not conducive to the growing of grass and shall be seeded. Hydroseeding may be required.

Quantities and combinations of landscaping materials shall be submitted to and accepted by the Approving Officer prior to installing such materials.

Driveway gradients shall have a maximum slope of 10% from the back of curb, back of sidewalk, or edge of shoulder, as applicable.

2.3.9 Geotechnical Requirements

The developer's engineer shall in all cases ensure that the structural integrity of the on-site soils are adequate to accommodate the expected loading, by providing a geotechnical evaluation prepared by a qualified geotechnical engineer.

Modifications to the Municipality's minimum pavement structure requirements shall be as outlined in Section 2.3.6, "Road Base".

2.3.10 Street Names

Street names for new streets must be accepted by the Approving Officer who shall have absolute discretion in this regard.

2.3.11 List of Standard Drawings

The following drawings are for road classifications defined in Section 2. Group 1 drawing include the basic road classifications identified in sections 2.2.

Group 2 drawings are options available to the developer upon agreement between the developer and the Approving Officer. Group 2 roads are defined in section 2.2.1.

Group 3 drawings provide construction designs for improvements which may be required depending on the classification of the road being built.

Group 1 - Basic Road Classifications

<u>Title</u>	<u>No.</u>	<u>Section</u>
Arterial 4 Land Undivided	R-6	2.2
Local Road	R-7	2.2
Collector Road	R-8	2.2
Cul-de-sac Road	R-1A	2.2
Paved Lane	R-12	2.2
Paved Walkway	R-10	2.2

Group 2 - Optional Road Classifications

<u>Title</u>	<u>No.</u>	<u>Section</u>
Minor Local Road, Urban	R-1	2.2.1
Major Local Road, Urban	R-2	2.2.1
Collector Road, Urban	R-3	2.2.1
Minor Commercial Road	R-4	2.2.1
Major Commercial Road	R-5	2.2.1

Group 3 - Optional/Required Depending on Road Classification

<u>Title</u>	<u>No.</u>	<u>Section</u>
Curb & Gutter	R-9	2.3.6
Culvert Installation	R-11	2.5.6
Hydrant Access path	R-13	3.2.5
Separate Sidewalk	R-14	2.3.7
Sidewalk Crossing	R-15	2.3.7
Transition Curb	R-16	2.3.7
Wheelchair Ramp	R-17	2.3.7
Typical Culvert Installations	R-18	2.5.6
Sandbag Bulkhead	R-19	2.5.6

2.4 MATERIALS

2.4.1. Roadway Embankment Materials

Earthfill for roadway embankment shall be native material with the exception of overburden, topsoil and rockfill. Earthfill shall be capable of being compacted to form a stable embankment, and shall be free of organic or deleterious material.

2.4.2. Select Granular Sub-Base Material

Select granular sub-base material shall be a pit-run gravel, or crushed gravel, screened if necessary, composed of inert, durable aggregate, uniform in quality and free from soft or disintegrating particles, clay or silt balls, organic material or other deleterious material, and shall be well graded from coarse to fine particles within the following gradation limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
75 mm	100
25 mm	60 - 85
No. 4	30 - 60
No. 200	2 - 10

That portion of the aggregate which passes the No. 40 sieve shall have a liquid limit of not more than 25 and a plasticity limit of not more than 6.

Shot rock may be accepted for use as granular sub-base material at the discretion of the Approving Officer. If shot rock is proposed, the proposed gradation of the shot rock material shall be submitted to the Approving Officer for acceptance prior to commencement of construction.

2.4.3. Crushed Granular Base Material

Crushed granular base material shall consist of inert, durable crushed aggregate, screened if necessary, uniform in quality and free from soft or disintegrating particles, clay or silt balls, organic material or other deleterious materials, and shall be well graded from coarse to fine particles within the following gradation limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
19 mm	100
12.5 mm	70 - 100
No. 4	40 - 80
No. 8	30 - 60
No. 16	20 - 45
No. 50	8 - 20
No. 200	2 - 8

Not less than 60 percent (60%) of the material retained on the No. 4 sieve shall be crushed particles with at least one fractured face. That portion of the material which passes the No. 40 sieve shall have a liquid limit of not more than 25 and plasticity limit of not more than 6.

2.4.4. Hot Mix Asphaltic Concrete

Hot mix asphaltic concrete mix design shall be prepared by a Professional Engineer and satisfy the following criteria, in accordance with ASTM D-1559, Marshall Test Procedure:

- Blows per face	50
- Marshall stability, kg at 60°C	450
- Flow index, mm	8 - 14
- % voids in mineral aggregate	
- 20 mm max.	14 min.
- 12.5 mm max.	14 min.
- % voids in total mix	3 - 5
- % voids filled with asphalt	75 - 85

Prime coat shall be MC-0 (MC-30) or as accepted.

Asphalt cement shall be prepared by refining petroleum, uniform in character, shall not foam if heated to 177 ° Celsius, and shall conform to grade 120 - 150 penetration when tested in accordance with ASTM-D5.

Tack coat shall be RC-0 (RC-30) or as accepted.

Coarse mineral aggregate shall consist of hard, clean, durable, crushed aggregate, in conformance with ASTM D692.

Fine mineral aggregate shall consist of natural sand or hard, clean, durable crushed aggregate.

Gradation of mineral aggregate, graded in accordance with ASTM C136 shall conform to the following, and shall form a smooth concave shaped curve when plotted on a semi-log chart:

<u>Sieve Size</u>	<u>Base Course</u>	<u>% Passing</u>	<u>Surface Course</u>
19.0 mm	100		-
12.5 mm	75 - 90		100
9.5 mm	62 - 82		78 - 94
No. 4	44 - 63		58 - 60
No. 8	-		52 - 74
No. 10	31 - 50		42 - 64
No. 20	23 - 41		28 - 48
No. 40	17 - 34		19 - 38
No. 100	10 - 20		10 - 24
No. 200	3 - 10		3 - 14

A minimum of 60% of the particles by weight retained on the No. 40 sieve shall have two or more fractured faces.

2.4.5 Concrete

The design of concrete mixes shall be prepared by a Professional Engineer and shall suit the local site conditions.

Cement shall be normal Portland Cement Type 10 or sulphate resistant Portland Cement Type 50, conforming to CSA A.5.

Water and aggregates shall conform to CSA A.23.1. Air entraining admixtures shall conform to CSA A.266.1. Chemical admixtures shall conform to CSA A.266.2 and shall be used only if accepted.

Concrete for curb and gutter and sidewalks shall be ready mix concrete designed to achieve a 28 day compressive strength of 25 kPa, with a maximum aggregate size of 25 mm, air entrainment 5 - 7%, water-cement ratio 0.50 maximum and slump of 25 - 75 mm. Premoulded expansion joint filler material shall be minimum 13 mm thick, cut to suit.

2.4.6 Grass Seed Mixture

Grass seed shall be premium quality with a purity of 95% or better and a germination rate of 85% or better. The species and percentages of the seed mixture shall be

<u>Species</u>	<u>% By Weight</u>	<u>% Live Pure Seed</u>
Perennial Rye Grass	30	8.1
Creeping Red Fescue	25	16.2
Red Top	5	28.1
Kentucky Blue Grass	10	21.6
Red Clover	20	17.3
Alsike Clover	10	8.6

Dry seeding application rates shall be 30 kg dry seed mix per hectare and 250 kg fertilizer per hectare, type 13-16-10.

Hydroseeding application rates shall be:

Seed Mix	70 kg per hectare
Fall Rye Grass	20 kg per hectare
Binder	40 kg per hectare (polymer, seaweed extract, vegetable gum)
Fertilizer	250 kg per hectare (13-16-10)

For playgrounds and lawns, Buckerfield playground mix or as accepted by the Approving Officer.

2.5 INSTALLATION

2.5.1 General

Copies of compaction test results, granular materials, sieve analyses, asphaltic concrete and concrete design mixes, asphaltic concrete and concrete test results shall be submitted to the Municipality.

The working area and haul roads shall be maintained in an orderly fashion and shall not be encumbered with equipment, materials or debris.

Dust control shall be maintained at all times by watering or other approved means.

The work shall be scheduled such that disruption of normal traffic and inconvenience to residents shall be kept to a minimum.

Proof rolling of the subgrade, subbase or base course may be required by the Approving Officer.

2.5.2. Clearing and Grubbing

The roadway right-of-way shall be cleared and grubbed of all standing or fallen trees, brush, timber, stumps or other debris and organic materials and these materials shall be disposed of by burning or other approved means. Burning shall be done in accordance with B.C. Forest Act and Municipal By-laws. Topsoil and overburden shall be stripped to a minimum depth of 300 mm.

2.5.3. Grading

The entire roadway right-of-way width shall be graded to the approved profile and cross-section, and uniformly compacted to a minimum 98% Standard Proctor. The completed profile and cross-section shall be accurate to a tolerance of 30 mm, with no soft, spongy or unstable areas, and free from ruts, waves and undulations.

2.5.4 Select Granular Sub-Base

Select granular sub-base material shall be placed on dry, firm sub-grade, and compacted in uniform layers not exceeding 150 mm in uncompacted thickness, to a minimum 100% Standard Proctor Density. The completed profile and cross-section shall be accurate to a tolerance of 15 mm, free from ruts, waves and undulations.

2.5.5 Crushed Granular Base

Crushed granular base course material shall be placed on dry, firm sub-base, and compacted in uniform layers to a minimum 100% Standard Proctor Density. The completed profile and cross-section shall be accurate to a tolerance of 12 mm, free from ruts, waves and undulations.

2.5.6 Culverts

Culverts shall be concrete, corrugated polyvinyl chloride (PVC), or galvanized corrugated steel (CMP) pipe designed for H20 loading for local roads and HS25 loading for arterial and collector roads in accordance with A.A.S.H.O.

Culvert sizes shall be designed for the anticipated runoff, 25 year return period, and shall be minimum 375 mm diameter. Driveway culverts shall be a minimum 7.0 m long.

In areas where culverts cross under major roadways or are located in critical or sensitive areas, culverts shall be sized for 1 in 100 year return period.

Culverts shall be installed to true line and grade, with a minimum 300 mm bury. End walls shall be rip-rapped or concrete-sandbagged.

2.5.7 Boulevards

Boulevard areas lying between the curb and property line of the road right-of-way shall be graded to drain to the curb and fill sections shall be compacted. The topsoil shall be raked free of roots and other debris and the boulevard shall be seeded.

2.5.8 Curb and Gutter, Sidewalk

All concrete work shall conform to the applicable CSA Standards. All curb and gutter and sidewalk shall be plant mixed Portland Cement concrete installed to true line and grade, placed on dry, firm granular base course. Alternative materials and methods of construction such as extruded curb and gutter may be considered and in some instances will be requested by the Approving Authority.

Concrete placed in forms shall be consolidated using mechanical vibration to achieve the required strength.

Expansion joint material shall be placed at each expansion joint, construction joint, beginning and end of curb with radius less than 15 m, around all structures such as poles, valve boxes, and hydrants and adjacent to any building or structure. Contraction joints shall be provided at intervals of 3 m in curb and gutter and 1.5 m in sidewalks. Finish shall be broom-finish with tooled, rounded edges.

Cold weather installation of concrete shall conform to CSA A23.1.19. Hot weather installation of concrete shall conform to CSA A23.1.20.

2.5.9 Hot-Mix Asphaltic Concrete

Priming and paving shall be carried out only on dry, smooth, compacted base course. Granular base courses and asphaltic concrete base courses shall be kept clean and uncontaminated until covered. Priming shall include granular and asphaltic base courses, edges of buildings, structures, gutters and pavement and shall not be carried out when the ambient temperature is less than 10 degrees Celsius.

Hot-mix asphaltic concrete shall be produced in a batch plant capable of drying and heating the mineral aggregate, heating the asphalt cement and accurately proportioning all materials to produce an asphaltic concrete possessing the required characteristics and within designated tolerances in accordance with ASTM D-99.

Hauling of asphaltic concrete shall be done in a manner such that the hot-mix is delivered to the site at the specified temperature and that no damage to surfaces of roadway occurs.

Hot-mix asphaltic concrete shall be placed, spread and compacted to produce a true profile and cross-section, of the specified thickness and density and with a uniform textured surface, free from roller marks. Minimum final densities shall be:

- Prior to October 1 - 97% of laboratory design density
- After October 1 - 98% of laboratory design density

Test results indicating conformance with the approved detailed design drawings and specifications shall be submitted.

3.0 WATER SUPPLY

3.1 INTRODUCTION

Water distribution design and construction shall conform to the requirements of the Provincial Ministry of Health and this schedule.

The system shall be designed to provide day-to-day requirements and also shall provide adequate flows for fire protection. The required flow shall be the sum of the maximum daily flow plus the required fire flow.

When a private water source is required for land development, the water must be tested and proven safe for human consumption. The Building Inspector will require a copy of the Medical Health Officer certificate prior to final inspection of any residence or commercial food, beverage or accommodation building built within the development.

3.2 DESIGN PARAMETERS

3.2.1 Per Capita Flows, Fire Flow Demands

Minimum design flows for domestic demand shall be:

Average daily domestic flow	455 litres/capita/day
Maximum domestic flow	1,010 litres/capita/day
Peak hour domestic flow	1,365 litres/capita/day

Additional design flows may be required for industrial, institutional or commercial development.

Fire flow shall be in accordance with the criteria outlined in "Water Supply for Public Fire Protection - A Guide to Recommended Practise", published by Public Fire Protection Survey Services.

The following minimum fire flows shall be met for the noted development types:

<u>Zone</u>	<u>Required Fire Flow</u>
Single Family Residential	60 litres/sec
Apartments, Townhouses	90 litres/sec
Commercial	150 litres/sec
Institutional	150 litres/sec
Industrial	225 litres/sec

Design populations used in calculating water demand shall be computed to accordance with the Municipality's population predictions or with the planned development in the area to be served, whichever is larger.

3.2.2 Pressure and Hydraulic Network Considerations

Water Pressure: Unless otherwise accepted, the following standards shall be used:

Minimum pressure at peak hour demand	265 kPa
Maximum allowable pressure	690 kPa (865 kPa with individual PRV'S)
Minimum fire protection residual (at hydrant, maximum day demand)	140 kPa

As a basic guideline, the following criteria may be used:

Design for maximum of (a) fire flows, plus maximum day demand or (b) peak hour demand, whichever is greater.

Hazen-Williams formula to be used.

Demand requirements shall be based on the Municipality's present water consumption records and the projected trends. Demand may vary for different locations within the Municipality.

Where there is an existing hydraulic network in place, the Municipality may provide information for design calculations.

Depending on the complexity and extent of the proposed distribution system, the Approving Officer may require a hydraulic analysis design showing minimum flows and pressures.

The maximum desirable length of any permanent non-interconnected watermain shall be 150 m. All mains exceeding 150 m, unless it is a temporary situation, shall be looped unless otherwise accepted. Dead-end mains shall not be promoted.

In residential areas, watermains servicing fire hydrants shall be 150 mm diameter or larger. Watermains 100 mm in diameter may be permitted for domestic service on dead end roads where no further extension is planned, no fire hydrant is required and the dead end main is less than 75 m long. Where a dead-end main is longer than 200 m or services more than one hydrant, watermain shall be 200 mm diameter or larger. In commercial/ industrial/institutional areas, the minimum watermain size shall be 200 mm diameter. However, should the hydraulic analysis indicate a need for larger size watermains, the larger size watermain shall be used.

Watermains shall generally be located in the road right of way. When watermains must cross private property, a registered utility right-of-way, minimum 6.0 m wide, shall be provided.

Design of pumping stations and control valving such as pressure reducing valves require the acceptance of the Approving Officer. Good engineering practice and consideration of operation and maintenance requirements should be considered in the design of these facilities.

3.2.3 Cover, Grades, Clearance

The minimum cover over any watermain shall be 1.0 metres.

The minimum grade for a main shall be 0.1%. The maximum grade shall be 20.0% unless provisions are made to anchor the pipe to the bottom of the trench with concrete poured in place. Watermain grades shall generally be consistent with the roadway grade.

The minimum vertical clearance between a watermain and any sanitary sewer shall be 450 mm unless the watermain is adequately encased with concrete encasement. The minimum vertical clearance to piping other than sanitary sewer shall be 300 mm unless the watermain is adequately encased in concrete.

The minimum horizontal clearance between a watermain and any sewer shall be 3.0 m unless the watermain is concrete encased or installed in a carrier pipe.

3.2.4 Valving

In general, valves shall be located as follows:

- a) In intersections, in a cluster at the pipe intersection or at the project property lines, to avoid conflicts with curbs and sidewalks:
 - i) 3 valves at "X" intersection
 - ii) 2 valves at "T" intersectionso that specific sections of mains may be isolated.
- b) Not more than 240 m apart, or 20 services, whichever is less, for single family residential. All other zones shall require special designs.
- c) Not more than 1 hydrant isolated.
- d) In gravel surfaced roads, outside the travelled portion of the roadway.

Valves shall be the same diameter as the main up to 300 mm diameter. Gate valves may be used up to and including 300 mm diameter. Butterfly valves shall be required in mains larger than 300 mm. Butterfly valves shall be installed in insulated chambers, with provision for positive drainage to storm sewer or other drainage facilities.

3.2.5 Hydrants

Fire hydrants shall generally be located at street intersections and shall be installed at a 850 mm offset from the centre of corner cuts. Where hydrants are required at mid-block locations, they shall be installed opposite property pins at a 850 mm offset. In no case shall fire hydrant spacing exceed a distance of 200 m nor should any residence be more than 90 m from a hydrant.

In high density residential, commercial, and industrial areas, hydrants shall be located at a maximum spacing of 75 m or as accepted. Additional hydrants may be required in high risk areas.

It shall be the Developer's responsibility to ensure the design and proposed locations of the fire hydrants will not conflict with existing or proposed street lights, power poles, etc.

All hydrants shall be installed with the pumper port facing the street and in no case shall the port be less than 450 mm above ground level.

Gate valves shall be installed with a flanged connection at the main to isolate all hydrants.

Hydrant access paths shall be installed as shown on the standard drawings on all roads with ditches.

3.2.6 Air Valves, Blow-Offs, Chamber Drainage

Air release valves shall be installed at the summit of all mains of 200 mm diameter and larger except where the difference in grade between the summit and valley is less than 600 mm. Chamber insulation and drainage shall conform to that specified for butterfly valve chambers.

A 50 mm diameter standpipe shall be installed on all dead-end mains. Standpipes shall be installed at a height of 750 mm above ground or in a box below grade as shown on the standard drawings.

3.2.7 Thrust Blocking

Concrete thrust blocking shall be provided at bends, tees, wyes, reducers, plugs, caps, and blow-offs. The area of thrust block bearing on pipe and ground shall be as shown on the standard drawings or as accepted. For mains 300 mm diameter and larger or in areas of poor soils, special designs may be required.

3.2.8 Service Connections

In addition to the Municipal requirements, service connection shall be subject to the requirements of the BC and National Plumbing Codes. Service connections 50 mm and larger diameter may be installed using a gate valve flanged to the tee at the main and a gate valve, temporary cap and thrust block at property line. Service connection 19 mm to 50 mm diameter shall include a corporation stop at the main, a saddle as accepted, and a curb stop and box.

The minimum size water service connections shall be as follows:

Residential	20 mm diameter
Other	50 mm diameter.

Whenever possible all water service connections shall be located at the centreline of the lot.

Connections shall be installed up to the property line at a minimum depth of 1.0 m. All services shall be marked with a 40 mm x 90 mm stake at the property line with the top 150 mm painted blue and marked with the length of the stake in meters. Curb stops shall be located at a 300 mm offset from property line and shall be extended to ground level.

3.2.9 List of Standard Drawings

The following drawings form part of Seciton 3:

<u>Title</u>	<u>No.</u>
Thrust Blocks	W-1
Fire Hydrant Assembly	W-2
Sewer and Water Services	W-3
Water Service Connection	W-4
Extension Service Box	W-5
Standpipe Detail	W-6
Watermain Relocation	W-7
Butterfly Valve Chamber	W-8
Air Release Valve Chamber	W-9
Encasement Pipe Detail	S-5
Trench Details in Paved Areas	S-6
Trench Details in Gravelled Areas	S-7
Trench Bedding Details	S-8
Trench Anchor Blocks	S-12

3.2.10 Private Water Source

Where a parcel is not required to be serviced by a community water system as a condition of approval and is to be used for residential development, there shall be proof, acceptable to the Approving Officer, of a source of potable water which produces not less than 2,300 litres per day and where there is to be more than one dwelling units on a parcel, there shall be an additional 2,300 litres per day for each such dwelling unit.

Where a parcel is not required to be served by a community water system and is to be used for a purpose other than residential development, the volume of potable water to be provided shall be determined in accordance with the proposed usage, but shall, in any case, not be less than 2,300 litres per day.

Where a private water source is required, the water provided must be potable water certified for drinking purposes by the Medical Health Officer. Certification must clearly state whether or not the water tested meets the Provincial standards on both chemical analysis and coliform count.

3.3. MATERIALS

3.3.1 Pipe

The materials outlined in Table 3.3.1 shall be considered acceptable for installation throughout the Municipality.

Table 3.3.1 – Pipe Materials and Specifications

<u>MATERIAL</u>	<u>SIZE RANGE (mm)</u>	<u>SPECIFICATION</u>	<u>USE</u>
polyethylene	19 - 50	CSA 8137-1-M1983 PE Series 160	Service connection
polyvinyl chloride	100 - 300	AWWA C900, Class 150 (bell & spigot joints)	distribution mains and service connections

Consideration may be given to use of alternate materials for major trunk mains.

3.3.2 Pipe Joints

Jointing of pipe shall be in accordance with manufacturer's recommendations.

A flexible joint shall be provided at locations where pipe is held in a fixed position by a rigid structure or support.

Unless otherwise approved, the amount of pipe deflection at joints and couplings shall not exceed 3 degrees, or one half the limit specified by the manufacturer, whichever is less.

3.3.3 Valves, Valve Boxes and Fittings

Solid wedge or double disc gate valves, iron body, bronze mounted, clockwise closure, manufactured in Canada, with non-rising stems, conforming to A.W.W.A. C500 specifications and combined with extension spindles and valve boxes shall be installed on all watermains up to and including 250 mm diameter. Valve manufacturer must be acceptable to the Approving Officer.

On mains larger than 300 mm in diameter, butterfly valves, flanged type conforming to A.W.W.A. C504 specifications along with an insulated valve chamber shall be installed. Valves larger than 300 mm shall have a 100 mm diameter bypass line.

Where air release valves are required they shall be double acting, vacuum type, with cast iron bodies and 860 kPa flanges. A ball valve or gate valve with activator shall be installed beneath each air valve assembly. All air release valves shall be protected from frost by insulating the valve chambers.

Valve boxes shall be Terminal City NT Type 1, or as approved, and shall be locking unless otherwise accepted. Valve box risers shall be PVC pipe or as approved, suitable for the valve and valve box.

Fittings for PVC pipe shall be:

- a) Cast iron fittings manufactured to AWWA C110 designed for a working pressure of 1035 kPa.

- b) Asphalt coated ductile iron compact fittings manufactured to ANSI/AWWA C153/A21.53-84.
- c) PVC bends to CSA Spec. B137;.37 rubber gasket joints to ASTM D1869, Type 1, Grade 1, PVC to ASTM D1784, Class 12454-B.

Mechanical seal joints on fittings to pipe shall be formed by a bell and preformed rubber gasket suitable for the pipe to which the joint is made.

Flanged joints on fittings shall be flat faced conforming in dimension and drilling to ANSI B16.1.

Ends shall be flanged or belled to suit pipe ends.

3.3.4 Hydrants

Hydrants shall be compression type Terminal City Type 1 or approved equal and shall conform with A.W.W.A. Specification C502 and shall be flanged at 50 mm above the ground line. Hydrants shall have two hose nozzles and one pumper nozzle complete with caps. Hose nozzles shall be 63 mm in diameter and pumper nozzles 114 mm in diameter. Nozzle threads shall conform with British Columbia Fire Hose Thread Specification, 6 threads per inch.

Hydrant stems shall be turned counterclockwise to open. Stem seals shall be resilient "O-Ring".

Hydrant extensions shall be supplied complete with nuts, bolts, flange gaskets, operator extension and coupling.

Hydrants shall be supplied complete with nuts, bolts, flange gaskets, operator extension and coupling.

Hydrants shall be installed using flanged joints and shall be held in place by thrust blocks. Tie rods may be permitted for thrust restraint in situations where existing utilities limit the available space for concrete thrust blocks.

3.3.5 Service Connections

Corporation stops shall be in accordance with AWWA C800, with fittings ends suitable for use with compression fittings Mueller A-225 unless otherwise approved. Service saddles for connections to PVC and existing A.C. shall be double strap type.

Corporation couplings shall be in accordance with AWWA C800.

Polyethylene pipe with compression type fittings with stainless steel inserts shall be used for all connections up to 50 mm diameter and polyvinyl chloride with fittings in accordance with Section 3.3.3 for connections 100 mm diameter and larger. Service connections between 50 mm and 100 mm in diameter shall not be permitted.

Curb stops shall be Mueller A-617 or as approved, with drain. Curb boxes shall be adjustable type and have a sidewalk pattern top casting. Stationary rods shall be provided.

3.3.6 Pipe Bedding

Pipe bedding specifications shall conform to Municipal standards for Class "A", Class "B" and Class "C" bedding. Pipe bedding selection may vary for different material installed and for different locations within the Municipality.

3.4 INSTALLATION

3.4.1 Excavation, Bedding, Backfill, Restoration

The trench shall be excavated so that pipe can be laid to the specified alignment and depth with allowance for the specified trench wall clearances and bedding. Wall clearances shall be minimum 150 mm, maximum 400 mm, from the bottom of the trench to 100 mm above the top of the pipe.

Bracing, sheeting and trench side slopes shall be in accordance with Worker's Compensation Board safety requirements. Dewatering may be required to control trench water.

Bedding material shall be crushed gravel, sand, select native material or concrete. Bedding shall be compacted to 95% Standard Proctor Density.

Backfill material shall be approved select native material or pitrun gravel and shall be placed in such a manner to prevent damage to the pipe.

Backfill materials in travelled surfaces shall be compacted to 95% Standard Proctor Density, except for the upper 750 mm which shall be compacted in accordance with the adjacent travelled surface design requirements.

Surface restoration shall conform to the original condition or as accepted.

3.4.2 Pipe Laying

Pipe shall be installed in accordance with the applicable AWWA specifications, the manufacturer's recommendations and requirements of this Schedule.

Pipes shall be handled with the greatest care and with equipment designed so that no damage occurs to pipe or fittings.

Batter boards shall be erected over the trench or trench line at intervals of not more than 20m. The centre line of the required pipe line shall be marked on these boards and string or wire stretched between the boards and on this centre line. The pipe shall be kept to proper line by plumbing down from this string line. Each pipe shall be laid to grade by means of batter boards and a boning rod with a shoe which will enter the pipe and stand on the invert. A minimum of three (3) batter boards shall be in place at all times during excavation and pipe laying. Sufficient batter boards shall be placed so that sighting is possible along these boards from one manhole to the next. Alternate methods of grading and aligning the pipe may be considered.

All pipes shall be laid to horizontal line, with a tolerance of plus or minus 10 mm of the design line; and grade, with a tolerance of plus or minus 25 mm for water mains and services; with the spigot end pointed in the direction of the flow. The pipes shall be jointed in accordance with the manufacturer's recommendations except that joint deflections shall be allowed only up to one-half of the manufacturer's recommended tolerances. Particular care must be taken to see that the ends of the pipes are kept clean. Care shall be taken to properly align the pipe once the joints are forced home. Movement of the pipe once the joints is made shall be kept to an absolute minimum. Jumping on or dropping of pipe to obtain grade shall not be permitted.

Care shall be taken to prevent the entrance of trench water or other material into the pipe during installation.

3.4.3 Valves, Hydrants and Appurtenances

Valves shall be installed at the specified locations, in the vertical position. Valve boxes shall be installed plumb, centered over the valve, and such that traffic loads are not transmitted to the valve.

Hydrants shall be installed at the specified locations, set plumb and such that the pumper port faces, and is at right angles to, the road centreline, unless otherwise accepted. Drain outlets with drain rock shall be provided and kept free of obstructions. The ground flange shall be 50 mm above finished ground or sidewalk grade unless otherwise accepted.

Fittings shall be installed at the specified locations in accordance with the manufacturer's recommendations.

3.4.4 Thrust Blocking

Thrust block bearing areas shall be to Municipal standards. Concrete shall be 25 MPa minimum at 28 days.

Care shall be taken to ensure that concrete does not interfere with the operation of flange bolts and nuts or prevent proper operation of hydrant drains.

3.4.5 Service Connections

Service connections shall be installed at the specified locations and depths with the same tolerances as specified for pipe laying.

Curb stop boxes shall be set plumb and adjusted to finish grade.

3.4.6 Testing

Prior to testing, all new water mains are to be cleaned of debris by passing a line sized "pig" through the main or alternatively the main shall be video inspected and immediately afterwards the pipe ends shall be capped in preparation for testing and disinfection.

All water mains shall be tested in accordance with the appropriate AWWA specifications and the following criteria:

- a) The test pressure shall be 1035 kPa or 1.5 times the operating pressure, whichever is greater. The pressure test shall be maintained for a minimum of two hours.
- b) The allowable leakage shall be determined by AWWA formula:

$$L = \frac{N D P}{131,000}^{0.5}$$

L = allowable leakage in litres per hour

N = number of joints in test section

D = inside diameter of pipe in millimetres

P = test pressure in kPa

Service connections shall be tested with the watermain.

The Approving Officer shall be notified 24 hours in advance of the leakage testing and may elect to witness the test. All test data and leakage calculations are to be submitted to the Approving Officer.

3.4.7 Flushing and Disinfection

All water mains shall be disinfected by chlorination, after the system has been flushed of dirt and other debris. Chlorination methods shall conform A.W.W.A. C601 and all disinfection shall be acceptable to the Approving Officer and Public Health Inspector.

Upon completion of disinfection, the entire piping system shall be thoroughly flushed, filled with water and left in a condition ready for use.

Care shall be taken to ensure chlorinated water from the testing procedure is not discharged into fish bearing streams. Dechlorination may be required prior to discharge.

4.0 SANITARY SEWERS

4.1 INTRODUCTION

Sanitary sewer systems shall be designed and installed in accordance with the requirements of the Ministry of Environment, Waste Management Branch, "Guidelines for Assessing Sewage Collection Facilities", and the requirements noted in this Schedule.

4.2 DESIGN PARAMETERS

4.2.1 Design Flows

The sanitary sewer system shall be designed using the following minimum average daily flows for the zone noted:

Residential/institutional	=	360 litres/capita/day
Industrial/commercial	=	22,500 litres/day/hectare

An infiltration rate of 0.6 litres/sec/hectare shall be added to the above flows.

The design flows shall be calculated using the average daily flows plus the infiltration rate.

Peak flows shall be 4 times the average daily flow for contributing areas with populations less than 1,000; and 3.5 times the average daily flow for contributing areas with populations between 1,000 and 3,000. For populations of more than 3,000 persons, following the formula

$$M = \frac{1 + 14}{4 + P^{0.5}} \text{ shall be used.}$$

Where: M = ratio of peak to average flow
P = population in thousands

Design populations used in calculating average daily flows shall be computed in accordance with the Municipality's population predictions or with the planned development in the area to be served, whichever is larger.

4.2.2 Pipe Flow Formulas

Capacities of gravity sanitary sewer mains shall be determined using Manning's Formula:

$$Q = \frac{A R^{0.667} S^{0.5}}{N}$$

Where: Q = Design Flow in m³/sec
A = Cross Sectional Area in m²
R = Hydraulic Radius in m
S = Slope of hydraulic grade line in m/m
N = Roughness coefficient
= 0.013 for A.C., Conc. and P.V.C. Pipe

Calculations for capacities of sanitary sewer forcemains shall use the Hazen - Williams Formula:

$$Q = 0.278 CD^{2.63} S^{0.54}$$

Where: Q = Rate of flow in m³/sec
D = Internal pipe diameter in mm
S = Slope of hydraulic grade line in m/m
C = Friction coefficient
= 120 for all pipe

4.2.3 Manholes and Hydraulic Losses

Manholes shall be required at:

- all changes in grade
- all changes in direction
- all changes in pipe sizes
- all intersecting sewers
- all terminal sections
- downstream end of curvilinear sewers

Manholes shall be placed where future extensions are anticipated and shall be spaced no greater than 150 m apart.

Pipe intersections in manholes shall utilize smooth hand formed concrete channels to maintain uniform flows.

The invert of the downstream pipe shall not be higher than that of the upstream pipe. However, both pipes may be placed at the same elevation.

The springline of the downstream pipe shall not be higher than that of the upstream pipe.

Minimum drop in invert levels across manholes:

- i) Straight run - no drop required
- ii) Deflections up to 45° - 25 mm drop
- iii) Deflections 45° to 90° - 30 mm drop

A drop pipe shall be installed when the drop between inverts exceeds 0.6 m.

Inside ramps will be permitted up to 450 mm from invert to channel bed.

Where a small pipe joins a larger pipe, the energy gradient shall be maintained through the transition.

Manholes deeper than 4.25 m shall be provided with safety platforms in accordance with the Worker's Compensation Board requirements.

4.2.4 Temporary Cleanouts

Temporary clean-outs may be provided at terminal sections of a main provided that:

- a) Future extension of the main is proposed or anticipated.
- b) The length of sewer to the downstream manhole does not exceed 45.0 m.
- c) The depth of the pipe does not exceed 2.0 m at the terminal point, and
- d) No more than two (2) service connections are to be installed between the cleanout and the downstream manhole.

Clean-outs shall not be considered a permanent structure.

4.2.5 Minimum Pipe Diameter, Velocity, Grades and Cover

The minimum diameter for sanitary sewer installations shall be as follows:

- a) Sanitary Sewer Mains = 200 mm
(except last upstream portion which cannot be extended in the future, may be 150 mm diameter if less than 45 m long.)
- b) Sanitary Sewer Connections = 100 mm
(a minimum 150 mm diameter service shall be used for all commercial and industrial services)
- c) Sanitary Sewer Forcemains = 100 mm

The minimum velocity shall be 0.6 m/sec. There is no maximum velocity, however, consideration must be given to scour problems where flow exceed 2.5 m/sec., and anchoring must be incorporated where the grade(s) of the sewer are 15% or greater.

The grade of any sewer shall be governed by the minimum velocity required. However, the last section of a main that will not be extended in the future, shall have a minimum grade of 1.0% where 150 mm diameter pipe is proposed.

The minimum cover over any main shall be 1.0 m. The desired cover over any sewer forcemain is 1.2 m. Consideration must be given to both dead and live loads for pipe material being utilized.

The depth of the sewer must be sufficient to provide 'gravity flow service connections to both sides of the roadway and must allow for future extension(s) to properly service all of the upstream tributary lands for ultimate development.

Where it is not feasible to service by gravity connection to a sewer in the frontage street, a rear yard sewer may be required.

Where permitted, horizontal curves will require a constant offset and/or shall be uniform throughout the curve. The radius of the curve shall not be less than 60 m. The design velocity must exceed 0.91 m/sec., the minimum grade shall be 1.0% and each joint is to be located by survey.

Sanitary sewers shall generally be located in the road right-of-way, with offsets from property line as shown on the standard drawings. When sanitary sewers must cross private property, a registered utility right-of-way, minimum 6.0 m wide, shall be provided.

4.2.6 Service Connections

In addition to the Municipal requirements, service connections shall be subject to the requirements of the BC and National Plumbing Codes. A backflow preventor valve shall be installed on all sanitary sewer service connections.

Service connections shall be provided to each lot fronting the main. All services shall enter the main at a point just above the springline.

Separate service connections shall be installed for each dwelling unit of a duplex, townhouse or row housing development for individual ownership.

Connections to new mains shall be made using wye fittings; connections to existing mains shall be made using saddles.

The minimum size for sanitary sewer service connections shall be 100 mm.

The minimum grade of 100 mm diameter service connection from the main to the property line shall be 2.0%. Where this grade cannot be met, a 150 mm diameter service connection at a minimum grade of 1.0% may be installed.

Desirable depth shall be 1.2 m at the property line or as accepted.

Service connections may be permitted into manholes provided that:

- i) The connection is not in an adverse direction to the flow in the sewer main.
- ii) The provisions noted in 4.2.3 are met.

All services shall be marked with a 40 mm x 90 mm stake at the property line. The top 150 mm of the stake shall be painted red, and the depth from the top of the stake to the invert of the service piping shall be noted in metres.

4.2.7 Pumping Stations and Force Mains

If at all possible, the use of sanitary pump stations is to be discouraged. Any proposed use of pump stations must receive prior approval from the Municipality. Any sanitary pump station, must be located within a right-of-way outside of the road dedication.

The size, capacity and type of these stations will be dependent upon the development and catchment area involved.

All pumping station and force main design and installation shall be as accepted for the specific installation.

In conjunction with sanitary pumping facilities, the following criteria shall be noted in the design of force main systems.

a) Velocity

At the lowest pump delivery rate anticipated to occur at least once per day, a cleansing velocity of at least 0.9 m/sec should be maintained. Maximum velocity should not exceed 3.5 m/s.

b) Air Relief Valve

An automatic air relief valve suitable for sewerage applications, installed in an insulated manhole, shall be placed at high points in the force main to prevent air locking. If requested by the Municipality and within reasonable depths, the sewer shall be graded to eliminate air relief valves.

c) Termination

Force mains should enter the gravity sewer system at a point not more than 600 mm above the flow line of the receiving manhole. An inside drop pipe shall be incorporated.

d) Size

The minimum size for force mains shall be 100 mm diameter. All force mains shall be designed to prevent damage from superimposed loads, or from water hammer or column separation phenomena.

Consideration must be given to maintenance requirements in the design of all sewage pumping stations. Pump selection, wetwell volumes, control system, etc., shall be reviewed with the Approving Officer on a project by project basis.

4.2.8 List of Standard Drawings

The following drawings form part of Section 4:

<u>Title</u>	<u>No.</u>	<u>Title</u>	<u>No.</u>
Standard Manhole	S-1	Trench Bedding Details	S-8
Exterior Drop Manhole	S-2	Manhole Cover Insulation Detail	S-10
Manhole Benching	S-3	Anchor Block	S-12
Standard Sewer Connections	S-4	Location of Service Connections	S-13
Encasement Pipe Detail	S-5	Typical Residential Sewer Connection	S-14
Trench Details in Paved Areas	S-6	Manhole Cover and frame	S-15
Trench Details in Gravelled Areas	S-7		

4.2.9 On Site Sewage Disposal

Where a parcel is not required to be served by a community sewer system, such parcel shall be served by individual on-site sewage disposal.

An area, suitable for construction of on-site sewage disposal facilities and certified by the Medical Health Officer, shall be located on each parcel, and not smaller than the following as determined by the percolation rate of the soil in that area:

<u>Percolation Rate (min/2.5 cm)</u>	<u>Min. Size of Area of Soil (Square Metres)</u>
less than 13	300
13 or more, but less than 25	450
25 or more, but less than 30	600

The longest acceptable percolation rate is 30 minutes/2.5 cm.

There shall be a minimum of 120 cm of natural porous topsoil above the ground water table or any impervious layer in such area of soil and a representative number of test holes shall be dug in that area to a minimum depth of 120 cm to demonstrate this.

The area of soil required for sewage disposal shall be capable of meeting the siting and setback requirements for absorption fields in the Sewage Disposal Regulations, B.C. Reg. 411/85.

Percolation tests are subject to the certification of the Medical Health Officer, B.C. Ministry of Health, who will make a recommendation to the Approving Officer.

Percolation tests to test the area of soil are to be undertaken as follows:

- a) Percolation testholes shall be dug at points and elevations selected as typical in the area of proposed disposal field;
- b) One of these testholes shall be dug at each end of the area of the disposal field. Further holes may be required depending on the nature of the ground and the result of the first test and the size of the proposed field;
- c) Testholes shall be 300 mm square and excavated to the depth of the proposed absorption trench;
- d) To make the percolation test more accurate, any smeared solid should be removed from the walls of the testhole;
- e) If the soil contains considerable amounts of silt and/or clay, the testhole shall be presoaked before proceeding with the test. To do this, keep the hole as fully filled with water as possible for four (4) hours. Proceed with the test immediately after presoaking.
- f) To undertake the test, fill the testhole with water. When the water level is thirteen (13) centimetres or less from the bottom of the hole, refill the hole to the top. No recording of time need be done for these two fillings.

- g) When the water level after the second filling (step (f)) is thirteen (13) centimetres or less from the bottom of the hole, add enough water to bring the depth of water to fifteen (15) centimetres or more;
- h) Observe the water level until it drops to the fifteen (15) centimetre depth. At precisely fifteen (15) centimetres commence timing. When the water level reaches precisely twelve and one-half (12.5) centimetres depth, stop timing;
- i) repeat procedures (g) and (h) until the last 2 rates of fall do not vary more than 2 minutes per 2.5 cm;
- j) The time in minutes for the water level to drop 2.5 centimetres is the percolation rate for that hole and is recorded in minutes per 2.5 centimetres. The percolation rate of the absorption field is the average of the slowest rates of the percolation tests made for that field;
- k) Cover the holes, flag their location and repeat the test in other locations. Record the results and submit to the local authorities.

4.3 MATERIALS

4.3.1 Gravity Main Pipe

The materials outlined in Table 4.3.1 shall be considered acceptable for installation throughout the Municipality.

Table 4.3.1 - Gravity Sewer Pipe Materials and Specifications

Material for Gravity Sewers	Size Range (mm)	Minimum Specification	Use
Polyvinyl Chloride	100 - 150 200 - 375	CSA B182.1, SDR 28 ASTM, D3034, SDR 3	minor collection mains service connections
*Non-Reinforced Concrete	300 - 900	ASTM C14, Class III	major trunk mains
Reinforced Concrete	300 & Larger	ASTM C76, Class III	major trunk mains

- * Use of non-reinforced concrete pipe shall be at the sole discretion of the Approving Officer. Consideration must be given to dead and live loads when selecting pipe classes.

4.3.2 Force Main Pipe

The materials outlined in Table 4.3.2 shall be considered acceptable for installation throughout the Municipality.

Table 4.3.2 - Force Main Sewer Pipe Materials and Specifications

<u>Material for Gravity Sewers</u>	<u>Size Range (mm)</u>	<u>Minimum Specification</u>	<u>Use</u>
Polyvinyl Chloride	100 & Larger	AWWA C900	minor forcemain

4.3.3 Pipe Joints

All gravity sewer pipe shall be jointed using rubber gaskets or gasket fittings and couplings. All sewer force main piping shall be jointed as specified for water main piping.

4.3.4 Manholes

All manholes shall be precast concrete, minimum 1,050 mm inside diameter and shall conform to A.S.T.M. C478. Manhole slabs shall be precast or cast in place on compacted material to Municipal Standards using 20 MPA concrete and shall be 1,600 mm square.

Precast concrete lids shall be designed to withstand H-20 loading conditions. Cast iron frames and covers and manhole ladder rungs shall conform to Municipal Standards.

4.3.5 Temporary Cleanouts

Temporary cleanout barrels, covers, base and lids shall conform to standards for manholes, or as accepted.

4.3.6 Service Connections

Polyvinyl chloride pipe and fittings shall be used for all service connections.

4.3.7 Pipe Bedding

Pipe bedding classifications shall conform to Municipal standards for Class "A", Class "B" or Class "C" bedding. Pipe bedding selection may vary for different materials installed and for different locations within the Municipality.

4.4 INSTALLATION

4.4.1 Excavation, bedding, backfill, Restoration

Excavation, bedding, backfill and restoration shall conform to the requirements of Section 3.4.1 of this Schedule.

4.4.2 Pipe Laying

Sanitary sewer gravity and force main piping installation shall conform to the requirements of Section 3.4.2 of this Schedule. Vertical tolerance shall be 7 mm, plus or minus, for sanitary sewer gravity mains and 25 mm, plus or minus for gravity sewer force mains.

4.4.3 Manholes, Cleanouts, and Appurtenances

Manholes, cleanouts and appurtenances shall be installed at the locations shown on the approved design drawings and in accordance with the Standard Drawings.

Manholes shall be set plumb and shall be constructed concurrently with the laying of the pipe. Manholes shall be constructed so as to be free from both ground water infiltration and exfiltration of sewage. All joints shall be butter mortared, including base, barrel, cover, bricking and frame.

Inlet and outlet elevations shall be as shown on the approved design drawings with tolerances as specified for pipe laying.

4.4.4 Service Connections

Service connections shall be installed at the locations and depths shown on the approved drawings with the same tolerances as specified for pipelaying.

4.4.5 Flushing and Testing

Prior to flushing and testing, all new mains are to be cleaned of debris by passing a line sized "pig" through the main, and immediately afterwards capping the pipe ends in preparation for testing. This procedure will help to identify any misalignments on curved mains.

All sanitary sewers shall be visually inspected and flushed to determine that they are straight and free from silt, sand, earth or other debris. Exfiltration tests shall be carried out on gravity sewers with either air or water as outlined below.

Testing for sanitary sewer forcemains shall conform to the testing criteria for watermains, but need not include disinfection.

Exfiltration Test:

The allowable exfiltration (water method) shall be 10 litres per millimetre of pipe diameter per kilometre per day.

The allowable exfiltration (air method) shall be determined by filling the test section with air to a constant pressure of 25 kPa and maintaining a pressure above 20 kPa for a minimum of 5 minutes. After the stabilization period, the air supply shall be cut off and the pressure allowed to drop to 20 kPa. Timing shall commence at 20 kPa and shall continue until the pressure reaches 15 kPa. The minimum acceptable time period shall be determined by the formula:

Minimum Time in min. = 0.040 x pipe dia. in millimetres

Where prevailing groundwater is above the sewer line being tested, the test pressure shall be increased 10 kPa for each metre of groundwater above the pipe.

An infiltration test may be required in areas of high groundwater, at the discretion of the Approving Officer.

The Approving Officer shall be notified 24 hours in advance of the leakage testing and may elect to witness the test. All test data and leakage calculations are to be submitted to the Approving Officer.

5.0 STORM DRAINAGE

5.1 INTRODUCTION

All storm drainage facilities shall be designed and installed as stated in this Schedule or as accepted.

5.2 DESIGN PARAMETERS

5.2.1 Design Methods and Flows

Design flows shall be based on the concept of the major and minor drainage systems and must attempt to maintain zero increase in peak flows over the pre development flows.

a) Minor System

The minor system consists of localized areas of development serviced by a localized piping system which discharges to the major component.

This system shall be designed to accommodate a two year storm event. However, in doing so, it is mandatory that a comprehensive flood routing plan be developed which analyses the impact of surcharging flows on adjacent services and property.

b) Major System

The major component of the system consists of a trunk mains which intercept flows from the minor system, natural drainage channels, overland flood routes and retention or detention facilities designed to reduce peaks. Overland flow through easements on private property is to be discouraged.

This system shall be designed for a 100 year storm based on a recognized calculation method. It shall further conform to any stormwater management plan which may have been established by the Municipality for each particular basin. Amendments to this program may only be permitted upon consultation with and detailed analysis by the Municipality.

In areas of potential flood plain, the major system hydraulic grade line shall be identified and, to prevent flooding, minimum basement elevations shall be identified and established by covenant.

5.2.2 Flow Capacities for Storm Sewers and Open Channels:

Capacities for capacities of storm sewer mains and open channels shall be determined using Manning's Formula:

$$Q = \frac{0.667 A R^{0.5} S}{N}$$

- Q = Design Flow in m³/sec
- A = Cross Sectional Area in m²
- R = Hydraulic Radius in m
- S = Slope of hydraulic grade line in m/m
- N = Roughness coefficient
 - = 0.013 for A.C., Conc. and P.V.C. pipe
 - = 0.024 for unpaved corrugated steel pipe
 - = 0.013 for concrete and asphalt line channels
 - = 0.02 for gravel lined channels
 - = 0.05 for natural and grassed channels

5.2.3 Minimum Pipe Diameters, Velocities and Cover

The minimum diameter for storm sewer installations shall be as follows:

- a) Storm Sewer Mains = 200 mm
- b) Catch Basin Leads = 200 mm
- c) Storm Sewer Service Connections = 150 mm (Residential/Single Family)
= 200 mm (All Other)
- d) Driveway Culverts = 375 mm

Storm sewer mains shall be installed with a minimum clear cover above the pipe crown of 1.0 m.

Unless otherwise accepted, the minimum velocity for pipes flowing full or half full shall be 0.60 m/s.

Where grades for storm sewers exceed 15%, pipe anchors shall be installed.

Offsets for storm sewer mains shall be as shown on the standard drawings. Offsets may be changed where existing services require otherwise.

5.2.4 Manholes and Catch Basins

Manholes shall be installed at all vertical grade changes and on horizontal alignment changes where no curves are used. The maximum allowable spacing between storm sewer manholes shall be 150 m. Increased spacing on sewers larger than 375 mm may be considered.

Catch basins shall be placed at regular intervals along roadways, at intersections and at low points. Wherever possible, the leads should be connected directly to a storm manhole. Saddle or wye connections shall be used where leads tie directly to the main.

The maximum allowable spacing for catch basins shall be 120 m.

5.2.5 Inlet and Outlet Structures

Inlet and outlet structures shall be designed to meet the requirements of each particular installation, however, the following guidelines shall be used as a basis for the minimum design requirements:

a) Endwall

Used to retain embankment fill over pipe. End walls shall be designed with a minimum height of 300 mm above the pipe crown and a minimum width of 300 mm on either side of the pipe.

b) Wingwalls

Used to transition outlet and inlet to existing channel shape. Wingwall heights shall match the endwall height, however, sloping may be used depending on the installation requirements. Wingwall lengths shall be a minimum of 1.5 times the endwall width. Wingwalls shall be installed on a 30° or 45° angle from a perpendicular to the endwall.

c) Aprons or Spillways

Used to prevent erosion of channel bottoms at inlet and outlet structures and shall be located to meet the requirements of each particular installation.

d) Energy Dissipators

Used to reduce intake or discharge velocities. Energy dissipators shall be installed as required.

e) Trash Grate

To be bolted and removable with a normal maximum 150 mm spacing of vertical bars.

f) Sedimentation devices shall be installed on all outlets to a creek.

All designs for inlet and outlet structures shall be subject to acceptance by the Approving Officer.

5.2.6 Ditches

Where ditching has been approved either alone or in conjunction with an underground system, all ditching shall be constructed to Municipal Standards for each particular road classification and shall be hydro-seeded in the following manner:

- a) A grass seed fertilizer and binder mixture applied at the rates shown in Section 2.4.6.

Energy dissipators may be required by the Approving Officer to prevent erosion due to slopes. Sediment control devices may be required.

Erosion protection may be required by Approving Officer in fill area ditching.

5.2.7 Service Connection

Storm sewer connections to single family residential lots are required unless indicated otherwise by the Approving Officer.

Storm sewer connections for multi-family, commercial, institutional or industrial lots shall be a minimum 200 mm diameter and shall be installed up to property line at a minimum depth of 1.0 m. All services shall be marked with a 40 mm x 90 mm stake at the property line. The top 150 mm of the stake shall be painted green.

Wherever possible, service connections shall be located 3.0 m from joint property lines on the lower side of the lot.

5.2.8 Trench Drains and Rock Pits

Trench drains and rock pits may be permitted in certain circumstances.

5.2.9 Natural Watercourses

Natural watercourses shall be protected as directed.

5.2.10 List of Standard Drawings

The following drawings form part of Section 5:

<u>Title</u>	<u>No.</u>	<u>Title</u>	<u>No.</u>
Standard Manhole	S-1	Trench Details in Gravelled Areas	S-7
Exterior Drop Manhole	S-2	Trench Bedding Details	S-8
Manhole Benching	S-3	Catch Basin Assembly	S-9
Standard Sewer Connection	S-4	Catch Basin Adjustment	S-11
Encasement Pipe Detail	S-5	Manhole Cover and Frame	S-15
Trench Details in Paved Areas	S-6	Rainfall Intensity Curve	S-16

5.3 MATERIALS

5.3.1. Pipe

The materials outlined in Table 5.3.1 shall be considered acceptable for drainage installation throughout the Municipality.

Table 5.3.1 - Acceptable Storm Drainage Pipe

<u>Material</u>	<u>Size Range (mm)</u>	<u>Minimum Specification</u>	<u>Use</u>
Reinforced Concrete	300 & Larger	ASTM C76, Class III	Major trunk mains, culverts
*Non-Reinforced Concrete	300 - 900	ASTM C14, Class III	Major trunk mains
**Polyvinyl Chloride	100 - 150 200 - 375 450 - 600	CSA B182.1 SDR25 ASTM, D3034, SDR 35 ASTM, F679, SDR 35 equiv. or ASTM F794	Service Connections Minor collection mains & service connections
***Corrugated Steel Pipe	375 & Larger		Culverts

* Consideration may be given to use of asphalt coated corrugated steel pipe on major trunk mains.

** Use of non-reinforced concrete pipe may be considered.

*** Use of ribbed PVC pipe, ASTM F794 may be considered.

5.3.2 Pipe Joints

All pipe shall be jointed with rubber gaskets or gasketed fittings and couplings.

5.3.3 Manholes

Manhole barrels shall be precast concrete, 1,050 mm min. inside diameter and shall conform to ASTM C478 for all mains up to 380 mm in diameter. For mains 400 mm and larger in diameter cast in place structures combined with precast sections shall be utilized.

Manhole slabs shall be precast or cast in place on compacted material to Municipal Standards using 20 MPa concrete and shall be 1,600 mm square.

Pipe intersections in manholes shall utilize smooth hand formed concrete channels to maintain uniform flows. Minimum invert drops shall be as follows:

Straight Run	=	no drop required
Deflections to 45°	=	20 mm drop
Deflections of 45° - 90°	=	30 mm drop

5.3.4 Catch Basins

All catch basins shall be precast concrete 750 mm inside diameter. Precast barrels shall conform to ASTM C478.

Catch basin slabs shall be precast or cast in place on compacted material to Municipal Standards.

Catch basins leads shall be 200 mm diameter and shall be installed a minimum of 460 mm fro the upper side of the precast slab to allow for sediment collection. Catch basin leads shall be installed at a minimum 2% slope from the catch basin to the main.

Catch basins leads shall be 200 mm diameter and shall be installed a minimum of 460 mm from the upper side of the precast slab to allow for sediment collection. Catch basin leads shall be installed at a minimum 2% slope from the catch basin to the main.

5.3.5 Inlet and Outlet Structures

Endwalls and wingwalls shall be constructed using concrete filled sandbags, reinforced concrete or prefabricated sections. Aprons and spillways shall be constructed of reinforced concrete or rip-rap.

5.3.6 Service Connections

Asbestos cement or polyvinyl chloride pipe shall be used for all service connections.

5.4 INSTALLATION

5.4.1 Excavation, Bedding, Backfill, Restoration

Excavation, bedding, backfill and restoration shall conform to the requirements of Section 3.4.1. of this Schedule.

5.4.2 Pipe Laying

Storm sewer piping installation shall conform to the requirements of Section 3.4.2 of this Schedule. Vertical tolerances shall be 7 mm, plus or minus for storm sewer gravity mains.

5.4.3 Manholes, Catch Basin and Appurtenances

Manholes, catch basins and appurtenances shall be installed at the locations shown on the approved design drawings and in accordance with the Standard Drawings and Section 4.4.3 of this Schedule.

5.4.4 Service Connections

Service connections shall be installed at the locations and grades shown on the approved drawings with the same tolerances as specified for pipe laying.

5.4.5 Flushing and Testing

Prior to flushing and testing, all new mains are to be cleaned of debris by passing a line sized "pig" through the main, and immediately afterwards capping the pipe ends in preparation for testing. This procedure will help to identify any misalignments on curved mains.

All storm sewers shall be visually inspected and flushed to determine that they are straight and free from silt, sand, earth or other debris. Exfiltration tests shall be carried out with either air or water as outlined in Section 4.4.5.

An infiltration test may be required in areas of high groundwater at the discretion of the Approving Officer.

5.4.6 Ditching

Ditches shall be graded to line, width and grade as shown on the approved drawings. Culverts, inlet and outlet structures, energy dissipators and other appurtenances shall be as shown on the approved drawings.

6.0 STREET LIGHTING

6.1 INTRODUCTION

All street lighting systems shall be designed by a Professional Engineer competent in lighting design, and in accordance with the International Illuminating Society and Municipal standards.

All materials, equipment and specifications shall be subject to approval of the Provincial Electrical Inspector prior to submission to the Approving Officer for consideration.

The developer shall be responsible for obtaining all permits and payment of any fees required by the Provincial Electrical Inspector or the power utility company prior to start of construction.

Upon completion, the consulting engineer or contractor shall make provision to energize the system for inspection purposes and notify the Approving Officer the system is ready to inspect. After completion of such inspection by the Approving Officer of his appointed agent and correction of remaining deficiencies, the Municipality will then make application to energize the system when service is required.

Special permission must be obtained from the Approving Officer for use of 347/600V street light services and distribution.

Provision for future lighting of parks shall be made by installing ducts from the nearest street-light or junction to the park property line.

6.2 DESIGN PARAMETERS

6.2.1 Minimum Levels of Illumination

The levels of average horizontal illumination, in lux, for roadways and pedestrian walkways shall not be less than those outlined in Table 6.2.1.1.

Table 6.2.1.1 - Average Horizontal Illumination (LUX)

Road Classification	Main Commercial Areas	Industrial & Intermediate Commercial Areas	Residential Areas
Arterial	22	15	*11
Collector	13	10	* 6
Local	10	6	4
Pedestrian Walkways	6	6	4

- * Average horizontal illumination shall apply only to arterial or collector roads abutting residential properties. Arterial or collector roads traversing a residential area but not abutting residential properties shall be designed to meet industrial and intermediate commercial area standards.

Differentiation between areas shall be at the discretion of the Approving Officer.

The maximum uniformity ratio of horizontal illumination for roadways and pedestrian walkways using a maintenance factor of 0.90 shall be as outlined in Table 6.2.1.2.

Table 6.2.1.2 - Uniformity Ratios

<u>Road Classification</u>	<u>Uniformity Average: Minimum</u>
Arterial	3:1
Collector	4:1
Local	5:1
Pedestrian Walkways	5:1

6.2.2 Pole Locations

For arterial and collector roadways, pole installations shall utilize a staggered arrangement on both sides of the roadways and where possible be located on lot lines, away from driveways and underground services. On local roadways, pole installations shall utilize a one-side arrangement along the sidewalk side, however a staggered arrangement may be considered provided private utility companies are satisfied that no conflicts exist.

Illumination levels differ for different classifications of roadways and where these roads meet, a transition area shall be incorporated. These shall have a gradual increase in illumination level until the higher level is reached.

On curves the luminaire spacing shall be reduced to ensure uniformity of illumination. Where poles are situated on the inside of bends the spacing must be reduced to $\pm 55\%$ of the spacing on straight sections. On the outside of bends the spacing must be reduced to $\pm 70\%$ of the normal spacing. Reduction figures are general guidelines and uniformity levels should dictate the required spacing.

Consideration shall be given to the relative positions of luminaires and trees to ensure that a uniform light distribution is maintained.

6.2.3 Underground Ducting Locations

In general, conduit shall be placed on the light side of the roadway. However, where a staggered type lighting pattern is utilized, conduit shall be placed on both sides of the roadway.

6.2.4 Lamp Standards and Luminaires

The types of standards and luminaires for different road classifications shall be as per Table 6.2.4.

Table 6.2.4 - Standards and Luminaires

Road Classification	Standard Type	Height	Luminaire Description
Arterial	Davit Arm NAPCO #29180-110-000 as per Std. Dwg. No. 1	9.14 m	150 watt high pressure sodium, Powerlite LXBC2227S-150 c/w Sylvania LU150/55/D deluxe coated lamp or as accepted.
Collector	Davit Arm NAPCO #29180-110-000 as per Std. Dwg.	7.62 m	150 watt high pressure sodium Powerlite LXBC2227S-150 c/w Sylvania LU150/55/D deluxe coated lamp or as accepted.
Local	Davit Arm NAPCO #29180-110-000 as per Std. Dwg. E-1 or accepted post top as per Std. Dwg. E-2	7.62 m	100 Watt high pressure sodium, Powerlite LXBC2227S-100 c/w Sylvania LU100/D deluxe coated lamp or as accepted as per Std. Dwg. No. E-4
		6.0 m	
Pedestrian Walkways	accepted post-top	6.0 m	as per Std. Dwg. No. E-4

All luminaires shall be High Pressure Sodium type for energy efficiency.

Standards for combination traffic signal - street light poles shall be in accordance with Std. Dwg. No. E-3.

6.2.5 List of Standard Drawings

The following drawings form part of Section 6:

Davit Streetlight	E-1
Post Top Streetlight	E-2
Streetlight Anchor Base for Type A & C Poles	E-3
Streetlight Anchor Base for Type B & D Poles	E-4
Handhole Wiring	E-5
Service Base	E-6
Median Warning Light Mounting Detail	E-7
Junction Box Details for Traffic Signals	E-8
Signal Head Patterns	E-9

6.3 MATERIALS

All materials shall be C.S.A. approved and conform to the following specifications:

6.3.1 Poles

Poles shall be one piece octagonal tapered, hot dipped galvanized steel to A.S.T.M. Standard A153 (610 gms/m² inside and outside) designed to withstand 160 km/h wind loading. All poles shall be refinished after installation to cover damaged areas. Street light poles and accessories shall be as detailed on the standard drawings.

6.3.2 Pole Bases

Precast concrete trapezoidal bases shall be installed on all pole installations. Under certain situations cast in place bases may be considered.

6.3.3 Conduit

All conduit, couplings, adapters and bends for street lighting shall be Scepter Manufacturing Co. Ltd. or equivalents, rigid unplasticized polyvinyl chloride, 50mm diameter minimum, Canadian Electrical Code, with maximum 30% conduit fill, unless otherwise accepted. Installation shall be in strict accordance with the manufacturer's recommendations using C.S.A. certified cement. Steel conduit for power service shall be hot-dipped galvanized malleable iron.

6.3.4 Grounding

Grounding of neutral wire to grounding rod at each service and installation of a continuous ground conductor in the conduit system shall be provided in accordance with the Provincial Electrical Code, #8 size, colour coded green.

6.3.5 Conductors

All conductors shall be type RW 90 X-link stranded copper. Minimum conductor size shall be #14. Conductor minimum size for advance warning flashers shall be #12. High traffic heads shall be wired with cabtire.

6.3.6 Connectors

Connectors shall be solderless insulated connectors of the Marrette type, taped with black P.V.C. tape. Full compression lugs shall be used for connecting ground conductors to ground studs in hand-holes.

6.3.7 Luminaires

All luminaires shall be acrylic type II, III or IV with cut-off or semi-cut-off distributions, in accordance with Section 6.2.4.

Under special circumstances, the Approving Officer may required polycarbonate vandal resistant refractors.

6.3.8 Lamps

All lamps shall be 150 watts or 100 watt high pressure sodium as applicable, colour corrected, deluxe coated.

6.3.9 Conduit Bedding

Bedding for buried conduit shall be sand or crushed granular aggregate as specified for PVC water piping. Utility warning tape shall be installed above all buried conduit.

6.3.10 Junction Boxes

Junction boxes shall be cast aluminum or concrete as shown on Standard Drawing No. E-11. Cast aluminum boxes shall be used in sidewalks in commercial areas; concrete boxes may be used in all other areas.

6.3.11 Service Panels

Service panels shall be C.S.A. approved of the pole mounting or kiosk type as shown on the Standard drawings.

6.3.12 Photo-Cell Units

Photo-cell units shall be cadmium sulphide type having externally adjustable sensitivity, thermal on and off delay type for 120 volt operation and an integrally contained control relay capable of switching at least 1000 volt-amperes. The unit shall be provided with a twist-lock base to match the receptacle provided in the luminaire and the action shall be such that in daylight the relay is energized, holding open its normally closed contacts. The unit shall have a built-in surge protector and a lightning arrester.

Where pole mounting is required an outdoor receptacle with wall mounting bracket shall be provided.

6.3.13 Ground Rods

Ground rods shall be 19 mm diameter steel with hot forged point. Top ends shall be galvanized for a minimum distance of 250 mm for 1500 mm rods and 450 mm for 3 metre rods. Ground rods shall be full length copper weld.

6.3.14 Paint

Primer shall be Pittsburgh No. SN1120 or approved equal, and paint shall be Pittsburgh No. VN3366, or approved equal.

6.4 INSTALLATION

6.4.1 Layout and Positioning

Poles, pole bases, conduit and appurtenances shall be accurately located in accordance with the accepted drawings. Conduit shall be installed parallel or perpendicular to the road centreline and routed so as to run in a direct line between adjacent poles or junction boxes.

6.4.2 Conduit Installation

Conduit shall be installed in accordance with the manufacturer's recommendations.

Empty conduits shall be provided with an insulated #12 AWG copper wire and capped immediately after installation of the pull wire.

6.4.3 Poles, Bases and Luminaires

Bases shall be set plumb and oriented such that one side of the bolt square layout is parallel to the road centreline.

Poles shall be set plumb with no more than 6 shims per pole.

Luminaires shall be securely fastened to the poles, levelled and cleaned after pole erection.

6.4.4 Wiring and Equipment

Wiring and equipment installation shall conform to the B.C. Electrical Code and manufacturer's recommendations.

6.4.5 Inspection and Testing

Inspection and testing shall conform to the provisions of the B.C. Electrical Code and the provisions of Section 6.1 hereof.

6.4.6 Installation on Power Utility Poles

Where street lighting is to be installed on power utility poles, the installations shall conform to the lighting level requirements of this schedule and to the materials and installation requirements of the utility owner.

7.0 NON-MUNICIPAL UTILITIES

7.1 INTRODUCTION

Non-municipal utilities include natural gas, power, telephone and cablevision services.

7.2 NATURAL GAS

Natural gas services are not required as a condition of subdivision, however, where natural gas services are to be installed, natural gas main and service installations shall conform to the requirements of the utility owner and natural gas mains shall be installed on both sides of new or upgraded roadways and located in accordance with the standard drawings herein. Installation of natural gas services, where available, is to be encouraged.

7.3 POWER

Electrical power services are required in accordance with Section 5 of this Bylaw. Where underground or overhead power services are to be installed, the installations shall conform to the requirements of the utility owner. Underground and overhead installations shall be located in accordance with the standard drawings herein.

7.4 TELEPHONE AND CABLEVISION

Telephone services are required in accordance with Section 5 of this Bylaw. Cablevision services are not required as a condition of subdivision, however, where cablevision service is available, installation of cablevision services is to be encouraged.

Where underground or overhead telephone and cablevision services are to be installed, the installations shall conform to the requirements of the respective utility owners and shall be located in accordance with the standard drawings herein.

8.0 STANDARD DRAWINGS

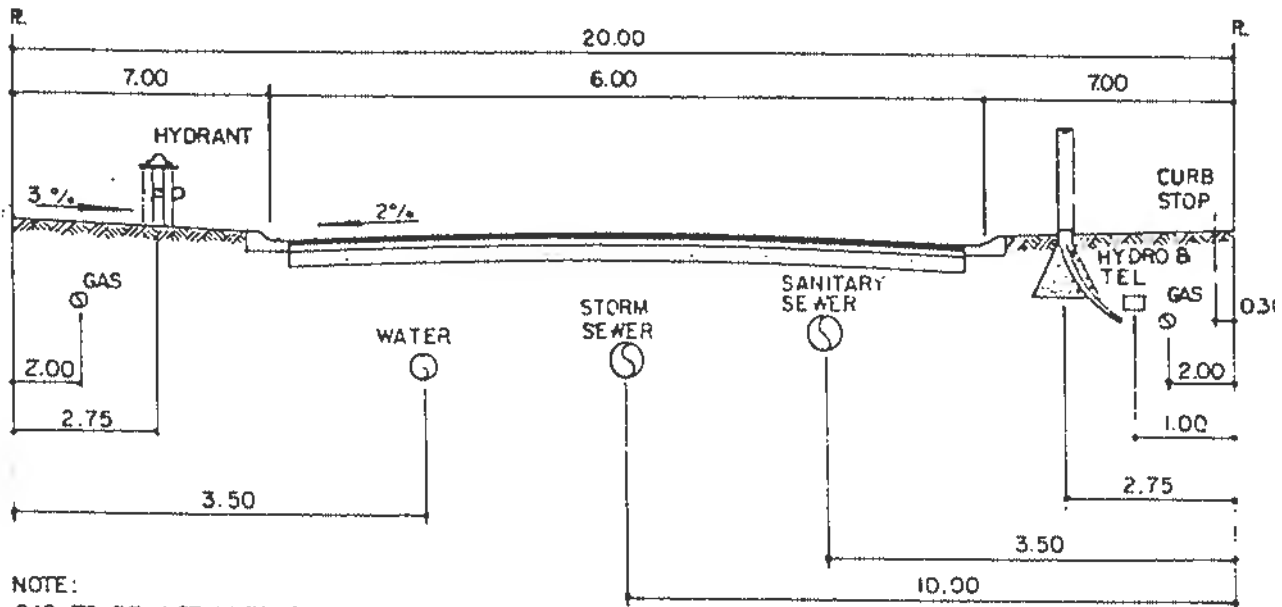
8.1 GENERAL NOTES

1. Where ASTM, AWWA or other non-Municipal Standard Specifications are referred to, the most recent edition at the date of commencement of construction will apply.
2. All castings shall be true to pattern and free from cracks, gas holes, flaws, and excessive shrinkage. Surfaces of the castings shall be free from burnt on sand and shall be reasonably smooth. Runners, risers, fins, and other cast on pieces shall be removed. In other respects, the castings shall conform to whatever points may be specially agreed upon between the manufacturer and the Approving Officer.

Frame material specification - Cast Iron ASTM A48 - Class 20

Grate and cover material specification - Ductile Iron ASTM A445 or cast steel grade 60 - 90 (Table 11 ASTM A 148)

3. "as approved" means as accepted for the specific application by the Approving Officer.
4. All valve boxes, manholes and catch basin covers or grates to be set 5 - 10 mm below finished paved asphalt road grade, and 20-25 mm below finished gravel surface grade.
5. Standard drawings are to represent the preferred methodology under standard conditions and are to be used wherever practical. This does not rule out the development or use of other methods after appropriate approvals have been obtained from the Municipality. Any special conditions or deviations from standard drawings must be submitted as design details and will, after approval, take precedence over the standard drawing. Therefore, any standard drawing developed for non-standard situation must specify on the drawing the specific use intended.
6. It is not the purpose of the standard drawings to detail a manufacturer's product but only the conditions of the Municipality's use of such product.



NOTE:

- 1 GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
- 2 ROLLED TYPE CURB AND GUTTER TO BE USED WHERE RESIDENTIAL PROPERTIES FRONT ON STREET.
- 3 MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 4.0 LUX.
4. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.



VILLAGE OF PORT CLEMENT

MINOR LOCAL ROAD - URBAN

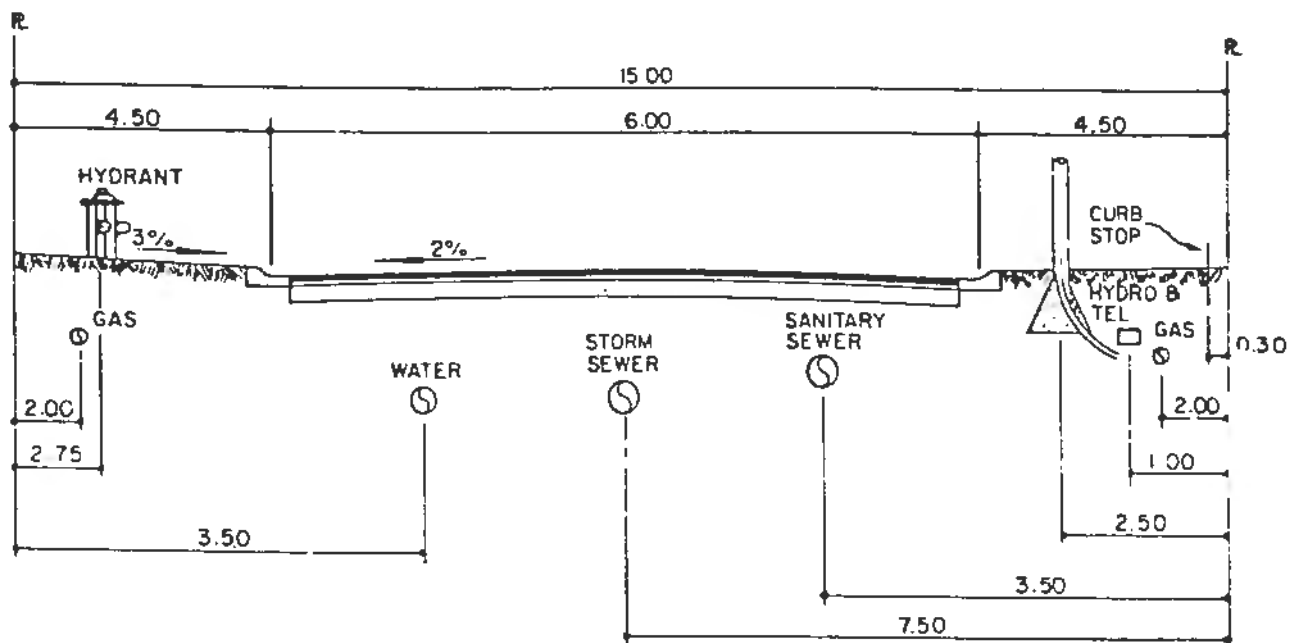
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NOTE.

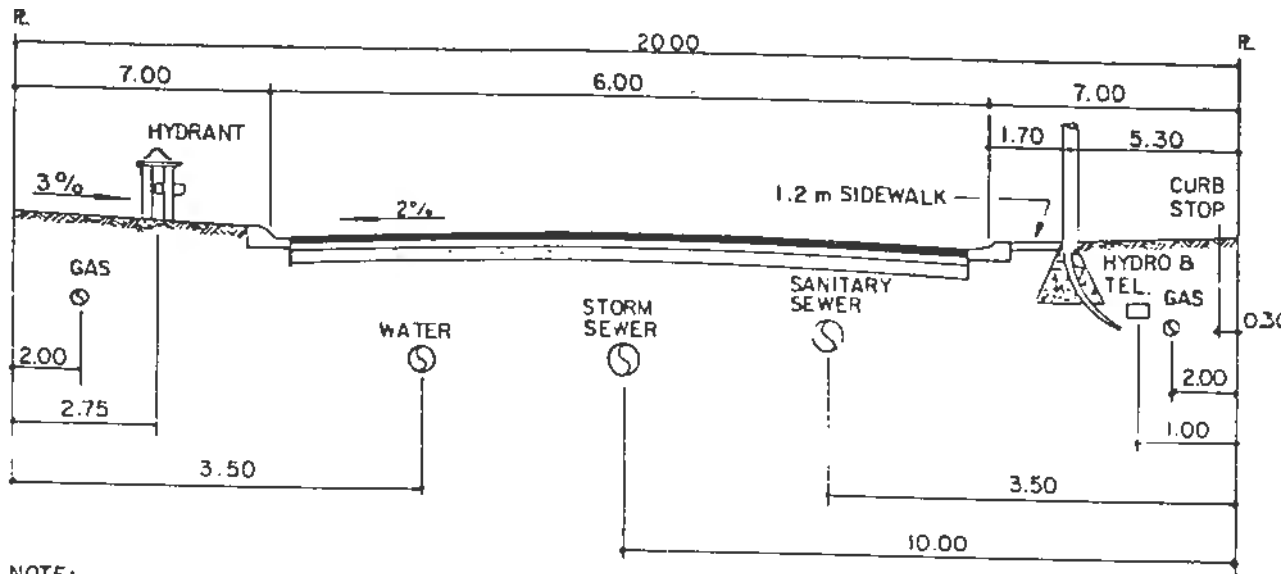
1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
2. ROLLED CURB AND GUTTER TO BE USED WHERE RESIDENTIAL PROPERTIES FRONT ON STREET
3. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 4.0 LUX.
4. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.



VILLAGE OF PORT CLEMEN

CUL-DE-SAC ROAD, URBAN

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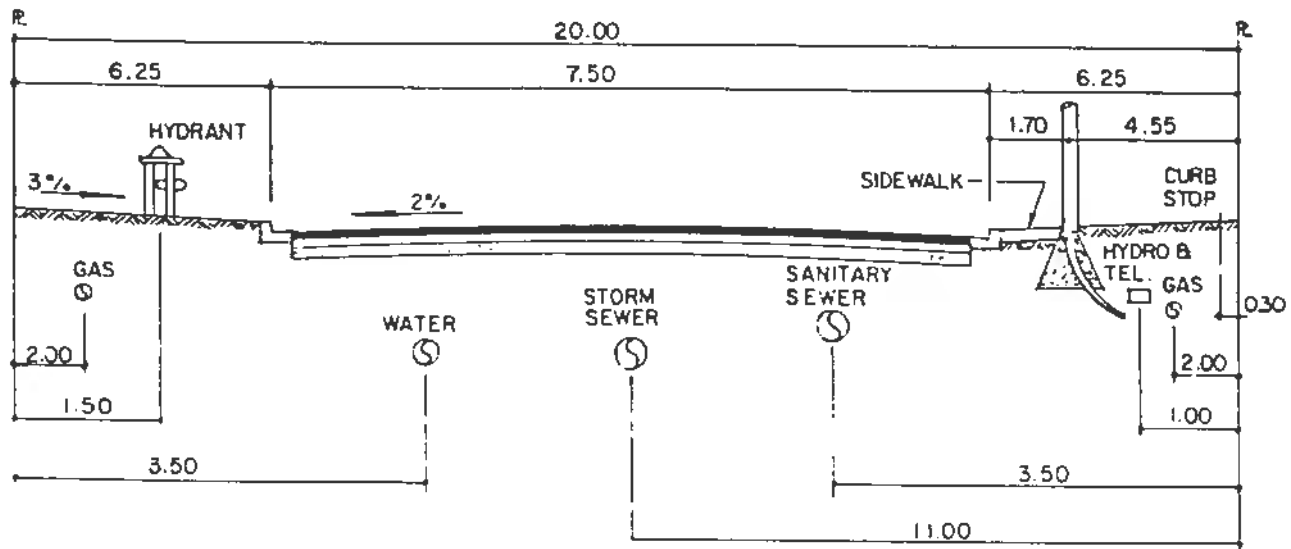
NOTE:

1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
2. SIDEWALK ONE SIDE ONLY.
3. ROLLED TYPE CURB, TO BE USED WHERE RESIDENTIAL PROPERTIES FRONT ON STREET.
4. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 6.0 LUX.
5. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.



VILLAGE OF PORT CLEMENT
MAJOR LOCAL ROAD - URBAN

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				R 2



NOTE:

1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
2. SIDEWALK ONE SIDE ONLY, OR BOTH SIDES WHERE MULTIPLE RESIDENTIAL FRONT BOTH SIDES OF STREET.
3. BARRIER TYPE CURB.
4. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 10.0 LUX
5. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.



VILLAGE OF PORT CLEMENTS

COLLECTOR

URB

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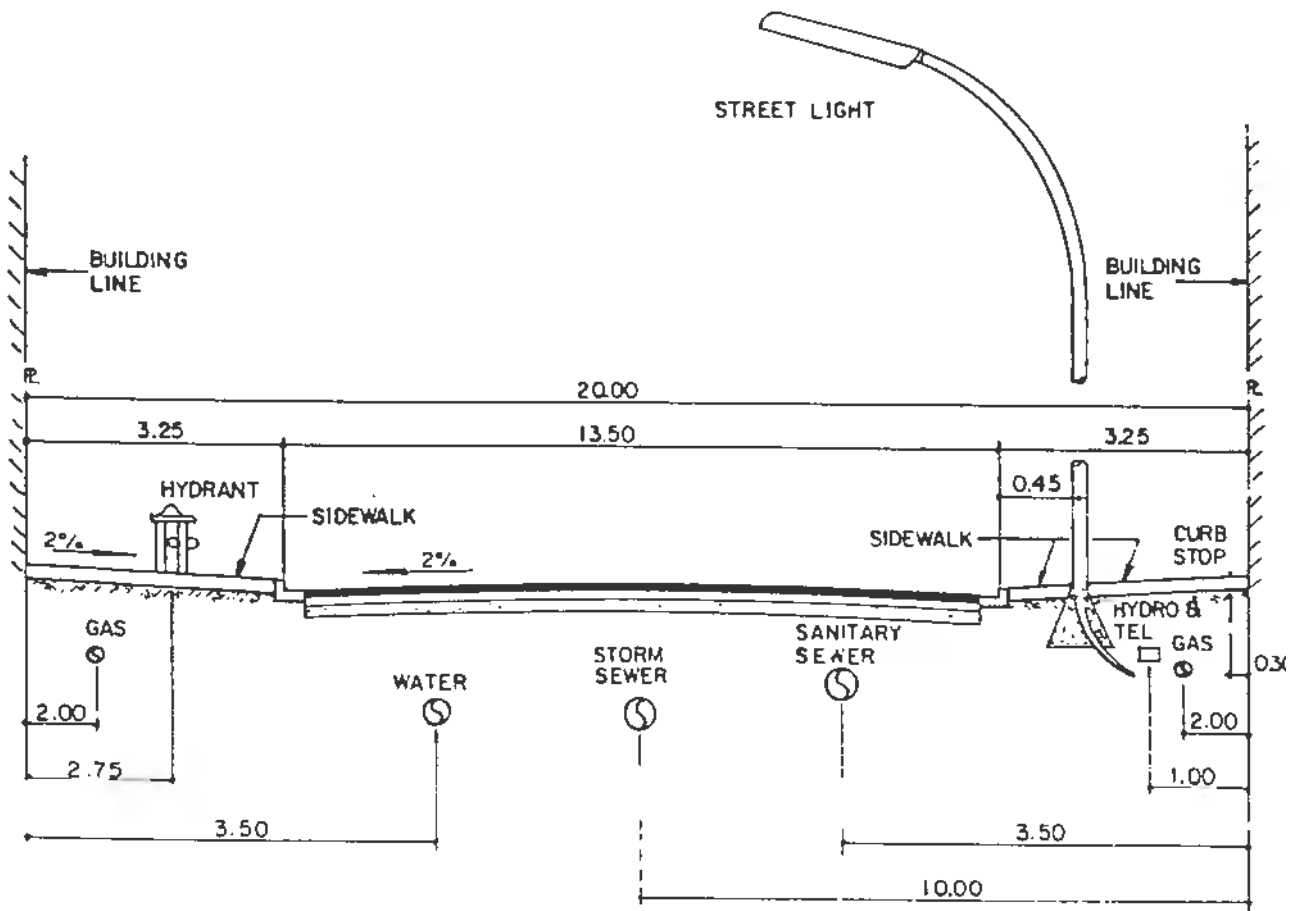
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DATE


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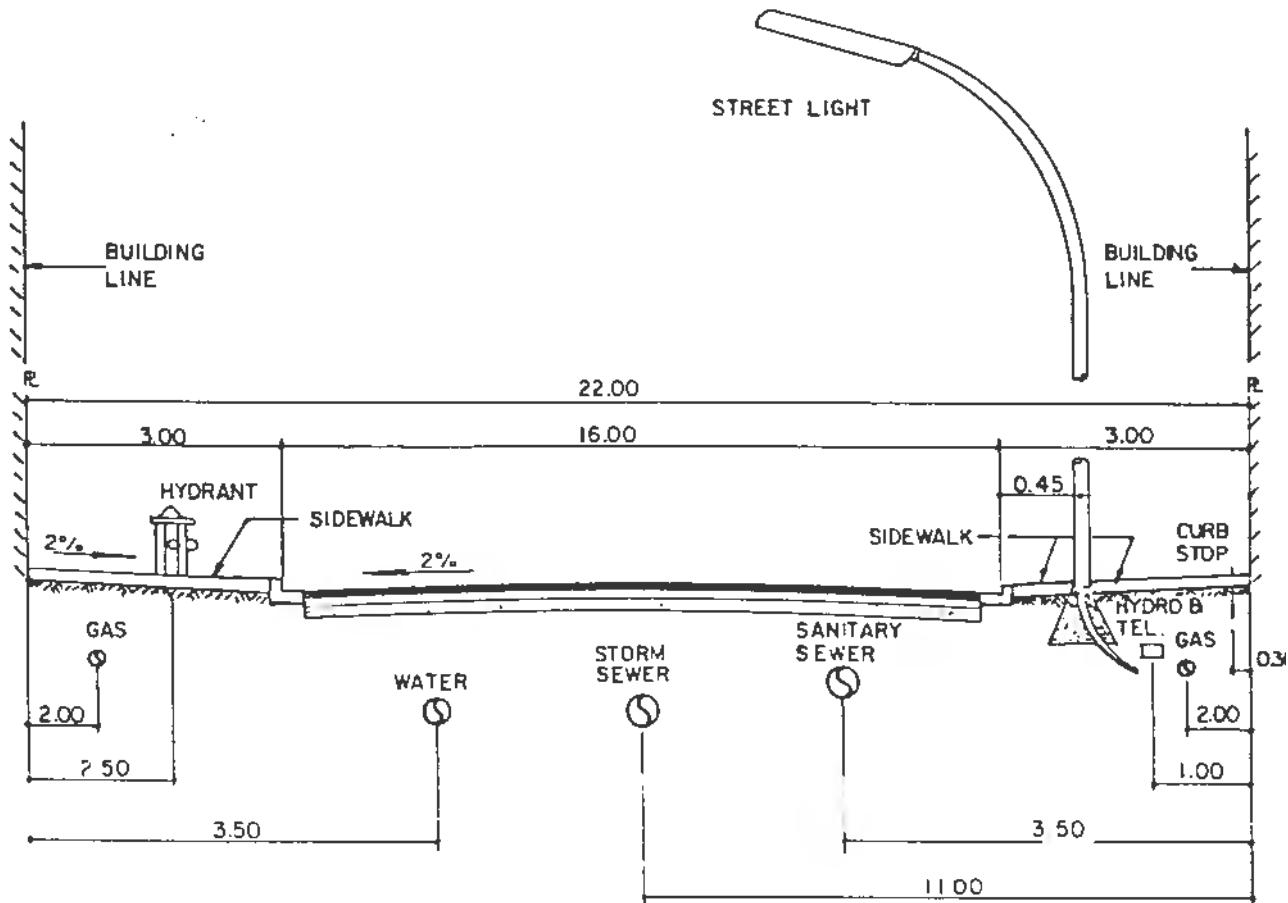
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R 3



- NOTE:
1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
 2. SIDEWALK ON BOTH SIDES OF STREET
 3. BARRIER TYPE CURB.
 4. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 10.0 LUX
 5. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.

 Stanley STANLEY ASSOCIATES ENGINEERING LTD		VILLAGE OF PORT CLEMENT		
		MINOR COMMERCIAL - 13.5 m. (SPECIAL APPROVAL REQUIRED)		
REV. N	DATE	DATE	APPROVED	DWG N ^o R



NOTE:

1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET.
2. SIDEWALK ON BOTH SIDES OF STREET
3. BARRIER TYPE CURB.
4. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 13.0 LUX
5. UNDERGROUND WIRING AS DIRECTED BY THE APPROVING OFFICER.



Stanley

STANLEY ASSOCIATES ENGINEERING LTD

VILLAGE OF PORT CLEMENTE

MAJOR COMMERCIAL - 16.0 m.

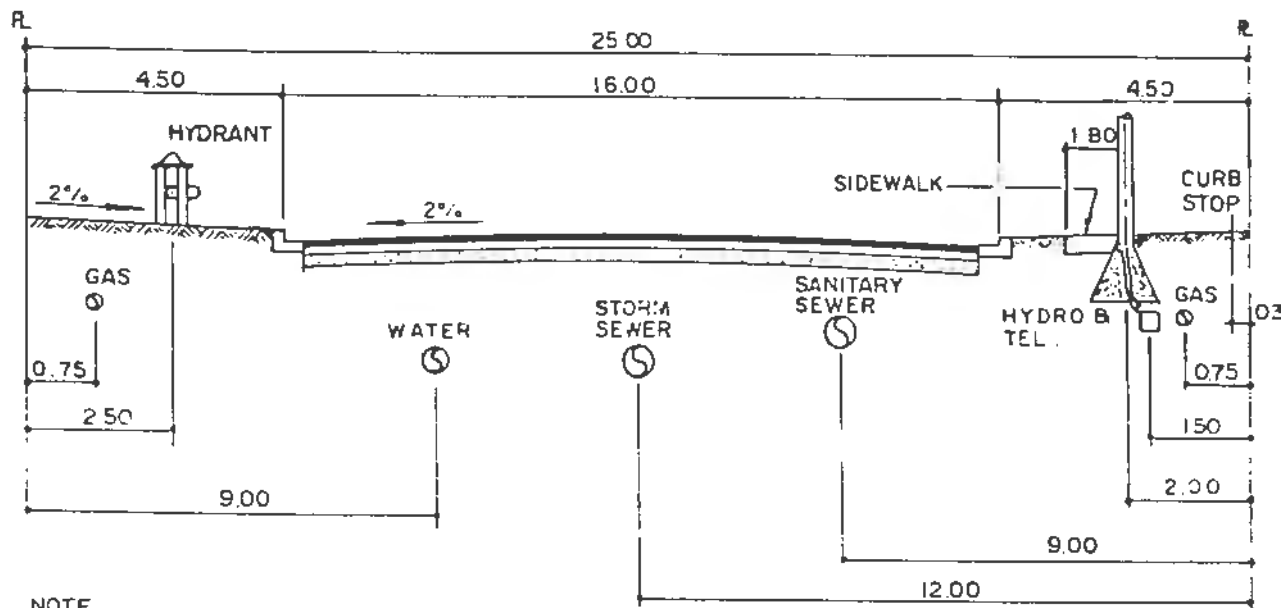
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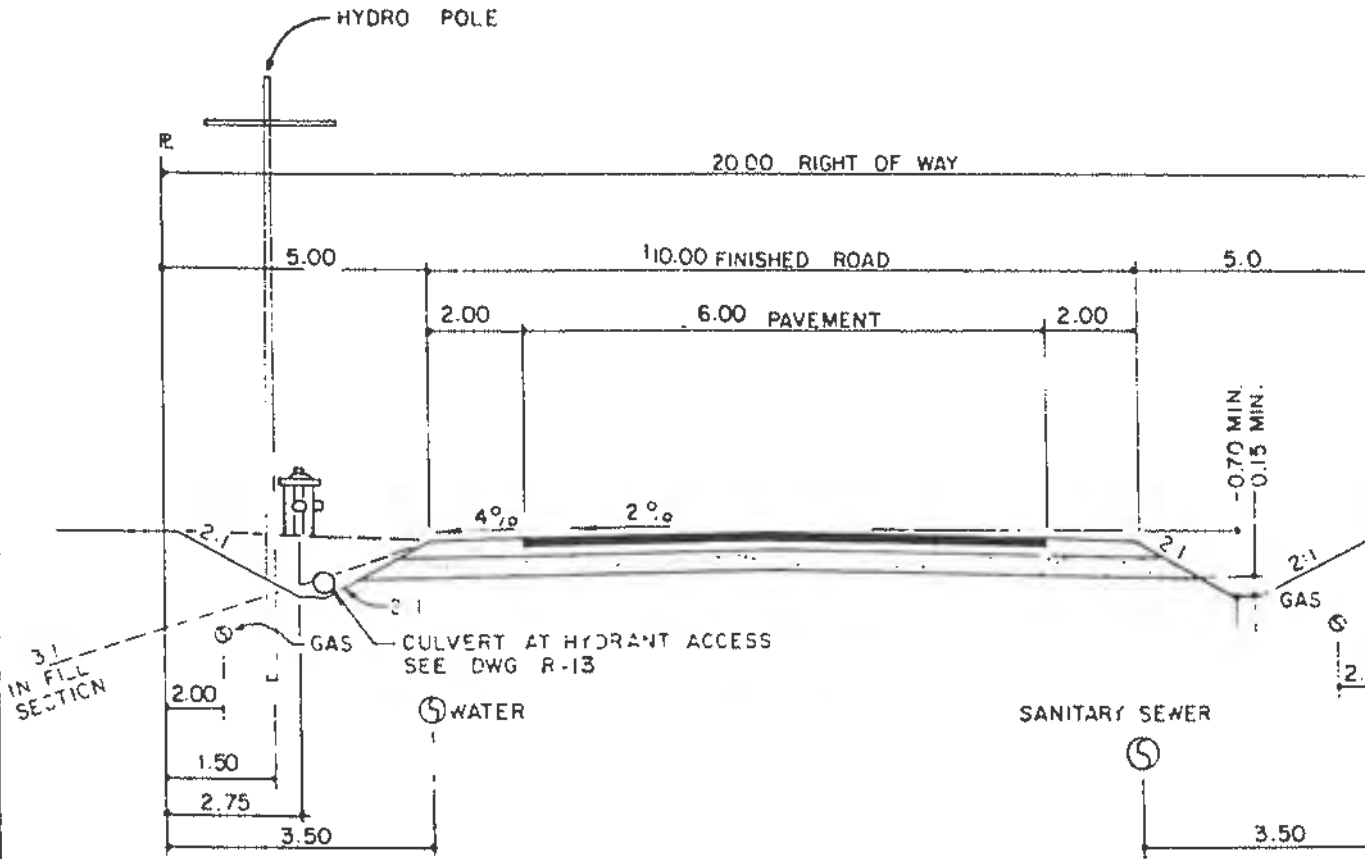
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NOTE.


1. GAS TO BE INSTALLED ON BOTH SIDES OF STREET
2. SIDEWALK ONE SIDE ONLY, OR BOTH SIDES WHERE COMMERCIAL OR MULTIPLE RESIDENTIAL FRONT BOTH SIDES OF STREET.
3. BARRIER TYPE CURB ONLY
4. MINIMUM AVERAGE MAINTAINED HORIZONTAL ILLUMINATION = 13.0 LUX.
5. UNDERGROUND WIRING REQUIRED AS DIRECTED BY THE APPROVING OFFICER.

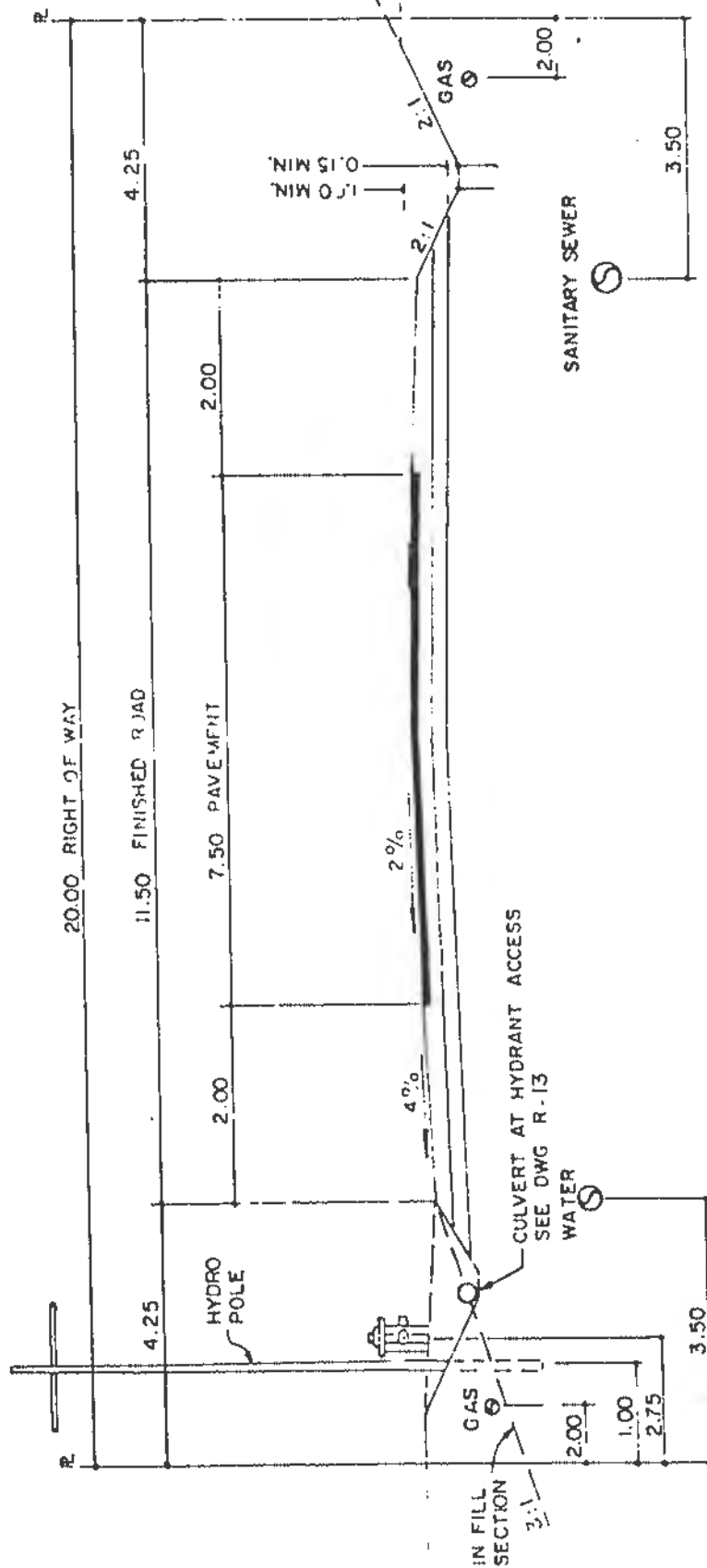
 Stanley STANLEY ASSOCIATES ENGINEERING LTD			VILLAGE OF PORT CLEMEN		
			ARTERIAL - 4 LANE UNDIVIDED		
	REV. N	DATE	DATE	APPROVED	DWGN



NOTE:

1 MINIMUM AVERAGE MAINTAINED
HORIZONTAL ILLUMINATION = 60 LUX

 Stanley STANLEY ASSOCIATES ENGINEERING LTD			VILLAGE OF PORT CLEMEN		
			LOCAL		
	REV. N	DATE	DATE	APPROVED	DWG. N ^o



NOTE:
 1. MINIMUM AVERAGE MAINTAINED
 HORIZONTAL ILLUMINATION = 110 LUX



VILLAGE OF PORT CLEMEN

COLLECTOR

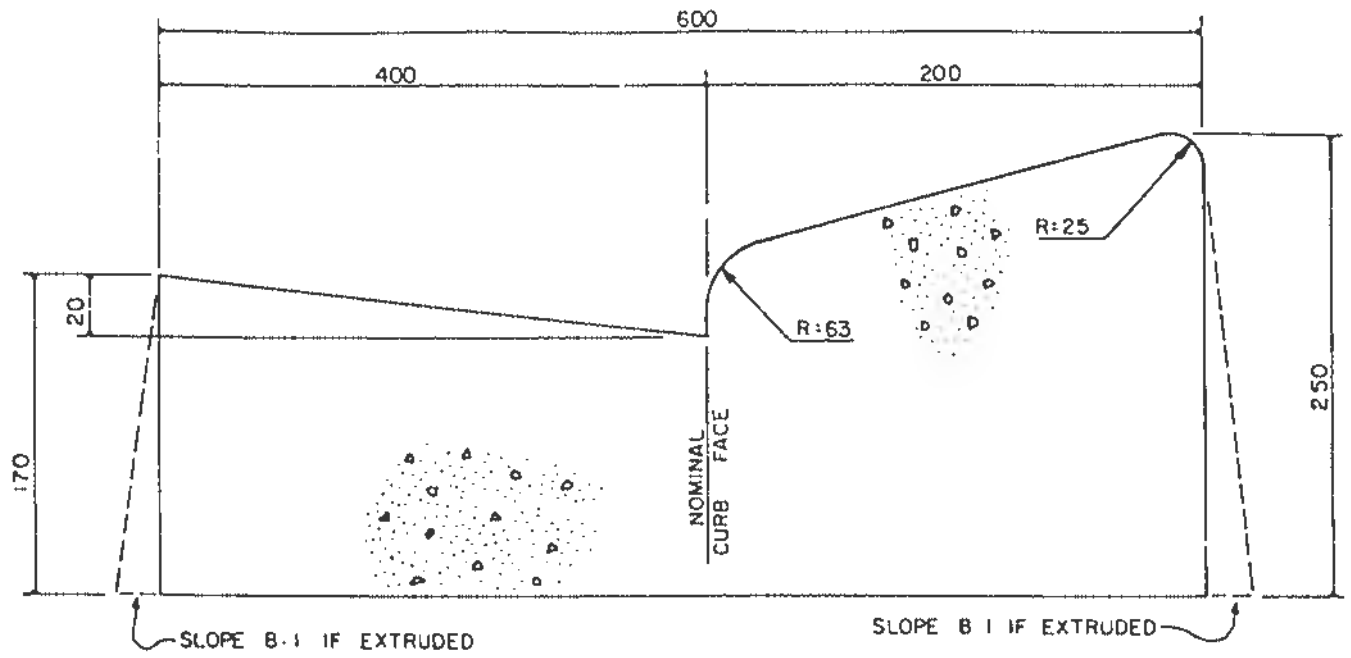
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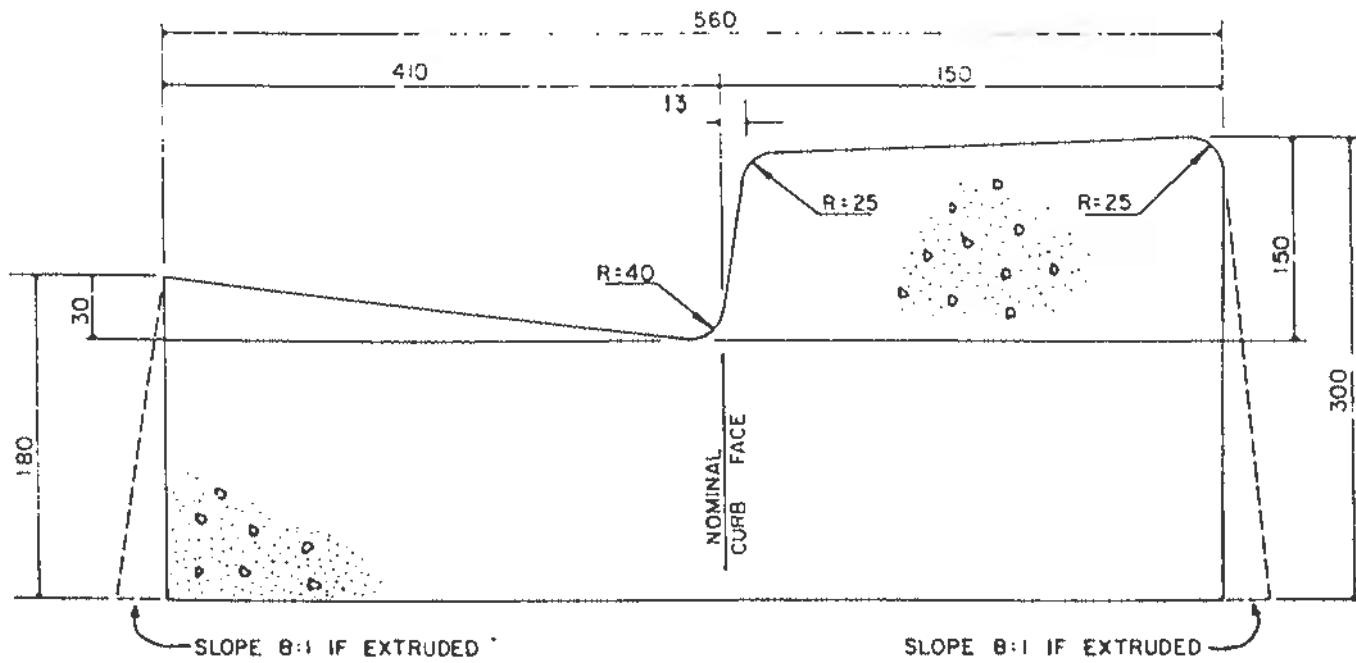
DATE

APPROVED

DWG. NO.



ROLLED CURB AND GUTTER
n.t.s.



BARRIER CURB AND GUTTER
n.t.s.



VILLAGE OF PORT CLEMENT

CURB AND GUTTER

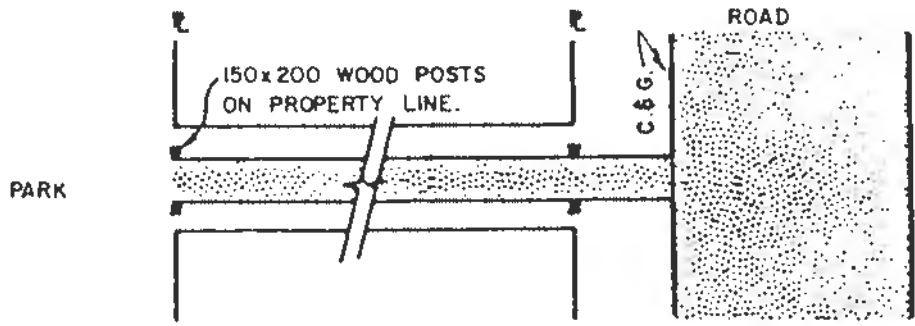
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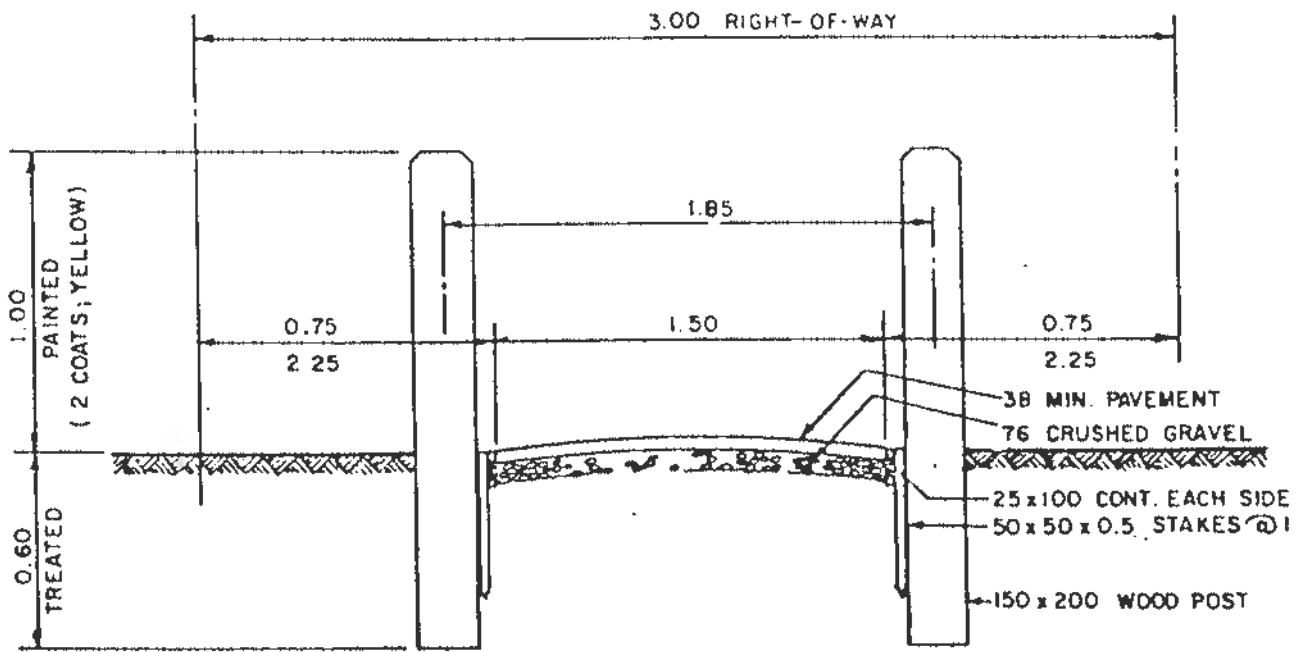
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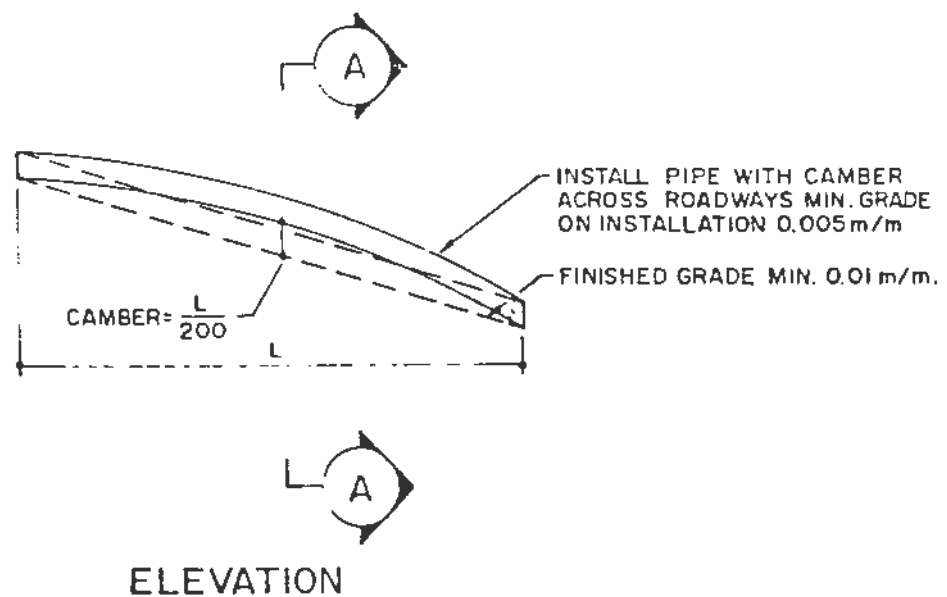
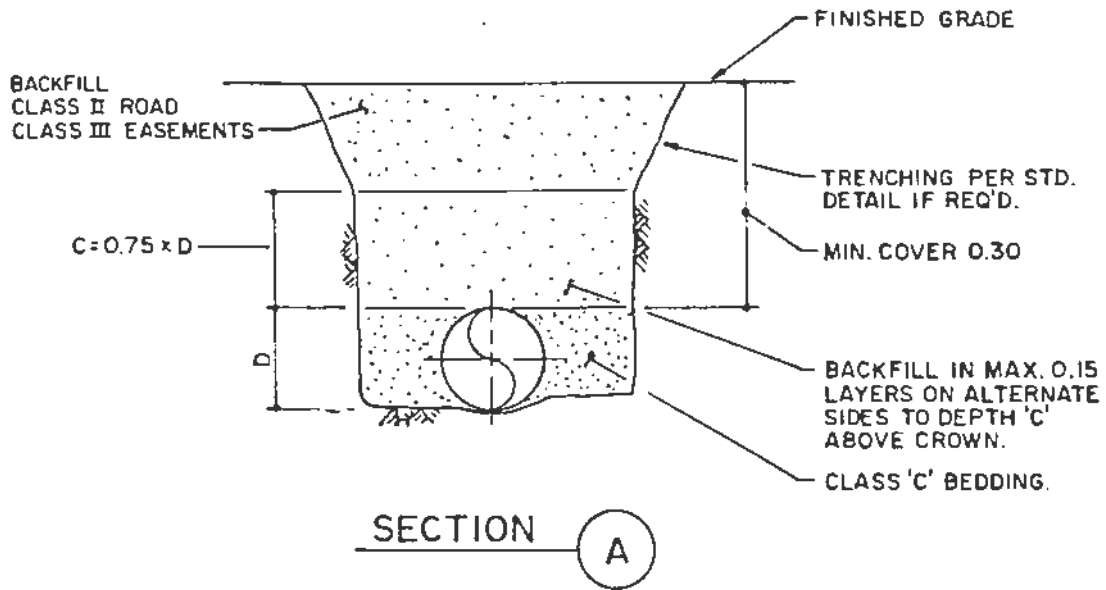



PLAN

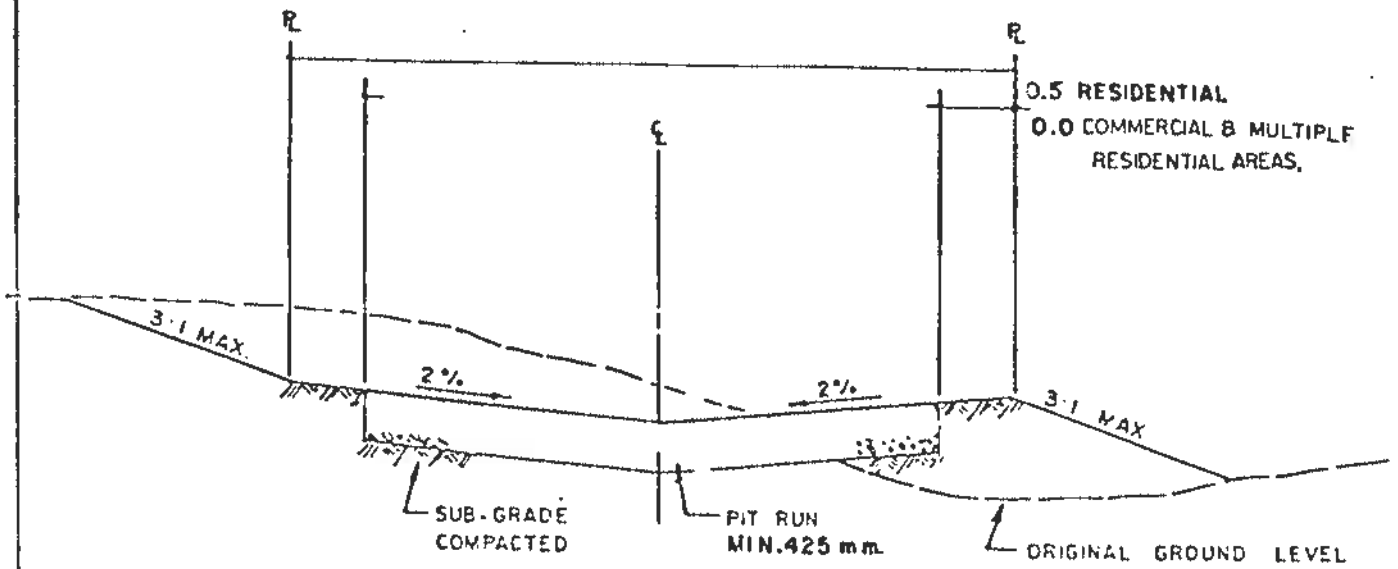


SECTION

 Stanley STANLEY ASSOCIATES ENGINEERING LTD.		VILLAGE OF PORT CLEMEN		
		PAVED WALKWAY		
REV. N	DATE	DATE	APPROVED	DWG No.




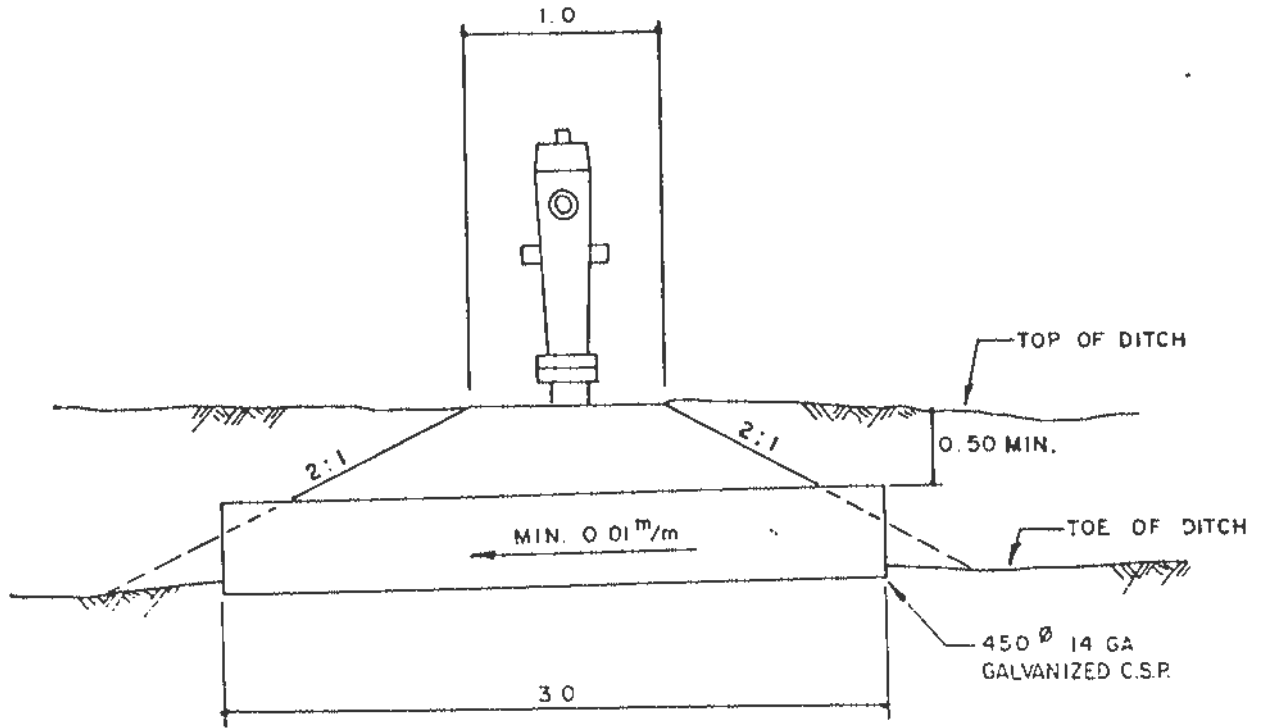
 Stanley STANLEY ASSOCIATES ENGINEERING LTD.			VILLAGE OF PORT CLEMEN		
			CULVERT INSTALLATION		
	REV. N	DATE	DATE	APPROVED	DWG No.




NOTES:

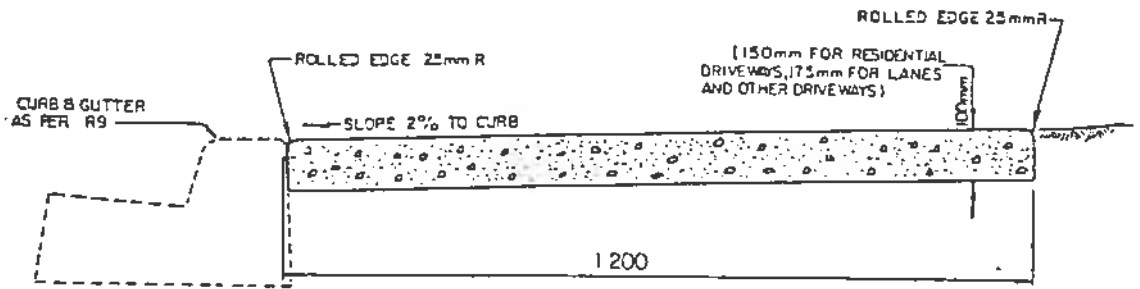
1. SIDE SLOPES IN CUT & FILL TO BE DONE AT TIME OF SUBDIVISION ROUGH GRADING.
2. DESIGN OF ROAD STRUCTURE TO SUIT LOCAL CONDITIONS.
3. PAVING OPTIONAL

 Stanley STANLEY ASSOCIATES ENGINEERING LTD	VILLAGE OF PORT CLEMENTS			
	LANE			
REV/N	DATE	DATE	APPROVED	DWG. NO. R 12

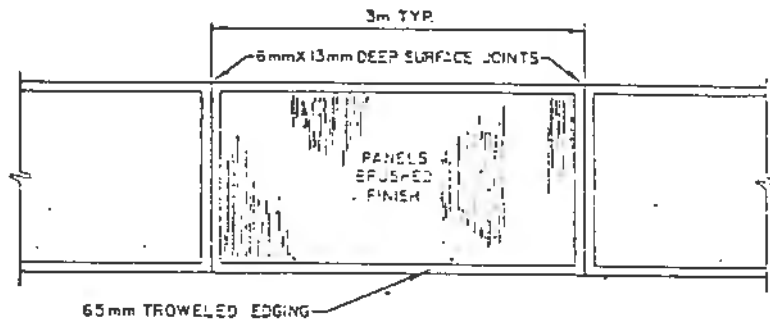


ELEVATION

 Stanley STANLEY ASSOCIATES ENGINEERING LTD			VILLAGE OF PORT CLEMEN		
			HYDRANT ACCESS PATH (RURAL ROADS)		
	REV N	DATE	DATE	APPROVED	DWG. No.



X-SECTION



PLAN

NOTES:

1. SUB-BASE AND BASE GRAVELS TO BE AS SPECIFIED FOR ADJACENT ROAD AND SHALL BE COMPACTED TO 100% STANDARD PROCTOR DENSITY.
2. SIDEWALK SHALL BE EXTRUDED OR FORMED.
3. CONCRETE SHALL CONFORM TO C.S.A. 423.1 EXPOSURE CLASS A (5-7% ENTRAINED AIR @ W/C = 0.45) 28 MPa.
4. ALIGNMENT TOLERANCES ± 3mm IN ANY 3m SECTION.
5. TRANSVERSE CONTRACTION JOINTS SHALL BE AT 3m C/C USING SURFACE GROOVING TOOL AND SHALL BE STRAIGHT AND PERPENDICULAR TO RADIUS.
6. FULL DEPTH X FULL WIDTH X 15mm WIDE EXPANSION JOINT TO BE PLACED AT THE BEGINNING AND END OF EACH CURB RETURN
7. WITH ROLLED CURB, SIDEWALK DEPTH TO BE 150mm THROUGHOUT.



Stanley
STANLEY ASSOCIATES ENGINEERING LTD.

VILLAGE OF PORT CLEMENT

SEPARATE SIDEWALK

REV'N

DATE

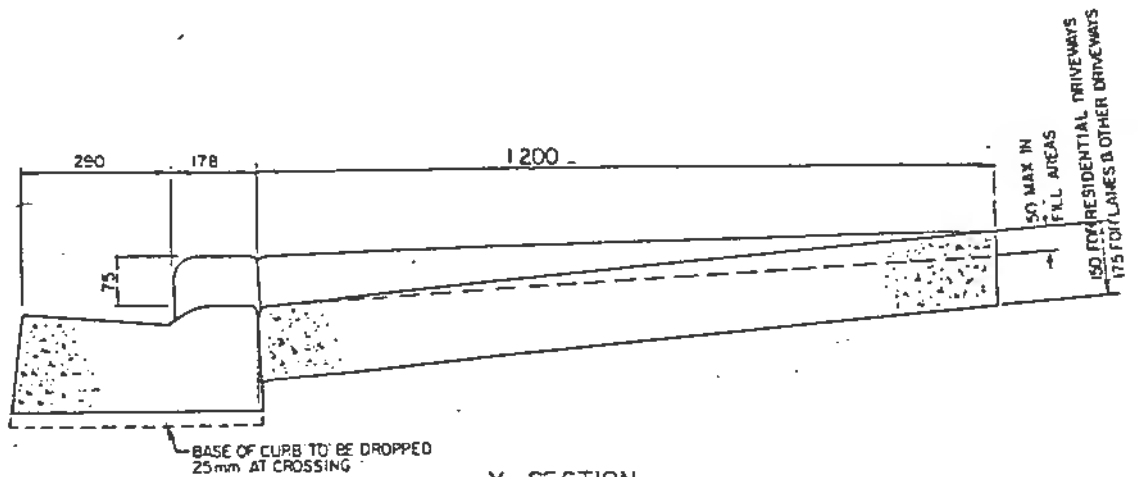
DATE

MAY '89

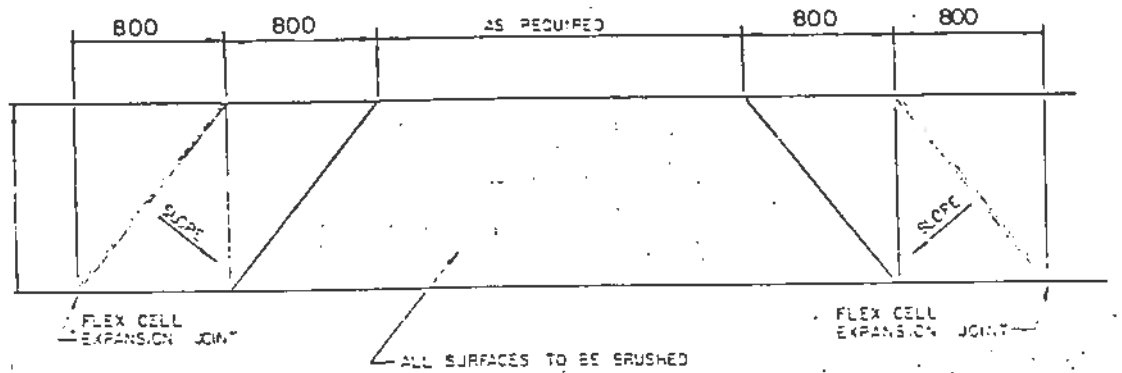
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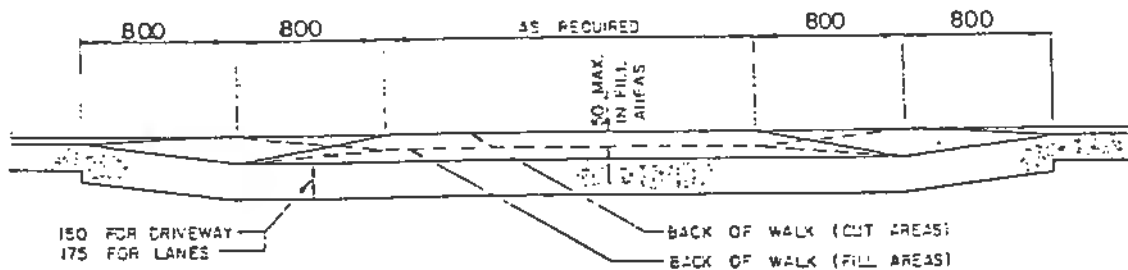
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X-SECTION



PLAN



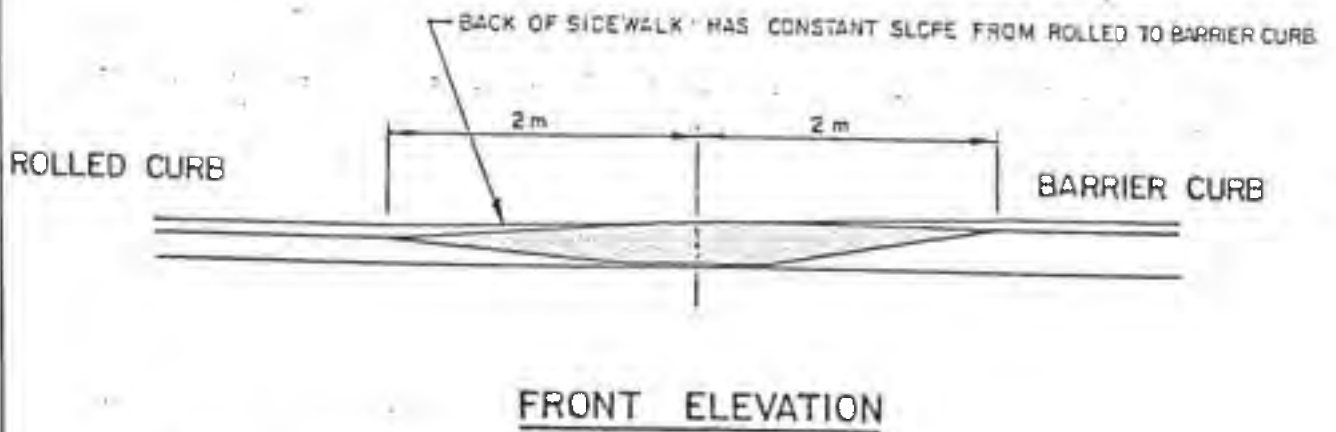
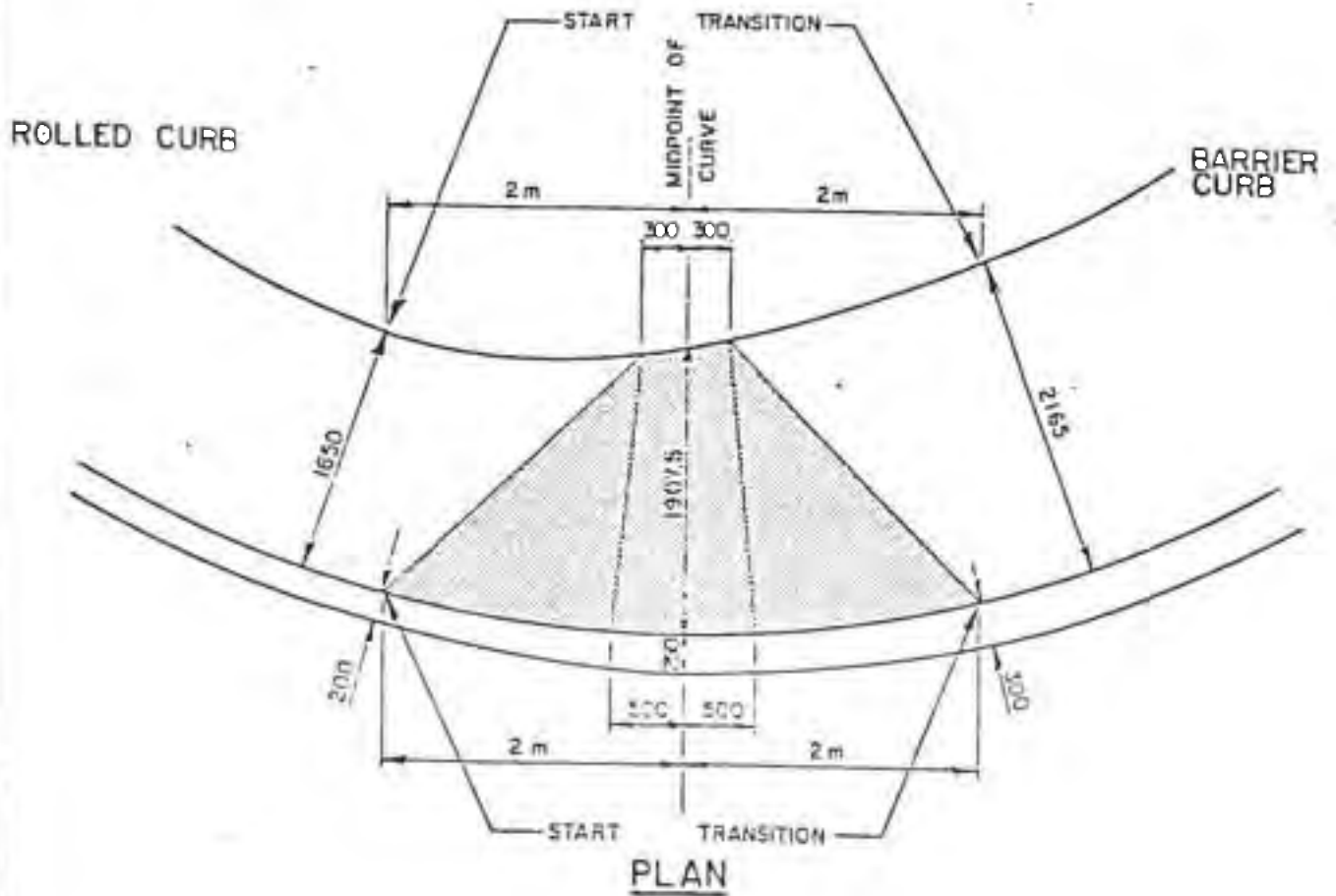
ELEVATION

- NOTES:
- (1) SUB-BASE SHALL BE COMPACTED TO 100% STANDARD PROCTOR DENSITY
 - (2) BASE SHALL BE CRUSHED GRAVEL, COMPACTED TO 100% STANDARD PROCTOR DENSITY
 - (3) CURB & GUTTER OR CURB & GUTTER WITH SIDEWALK SHALL BE EXTRUDED OR FORMED
 - (4) CONCRETE SHALL CONFORM TO CSA A231 EXPOSURE CLASS A1 ENTRAINED AIR & W/C (0.45) 28 MPa
 - (5) ALIGNMENT TOLERANCES = 3 mm IN ANY 3000 SECTION.
 - (6) TRANSVERSE CONTRACTION JOINTS SHALL BE AT 3000 mm c/c USING SURFACE GROOVING TOOL.
 - (7) ALL CONTRACTION AND EXPANSION JOINTS SHALL BE STRAIGHT.
 - (8) NO EXPANSION JOINT IN CROSSING.




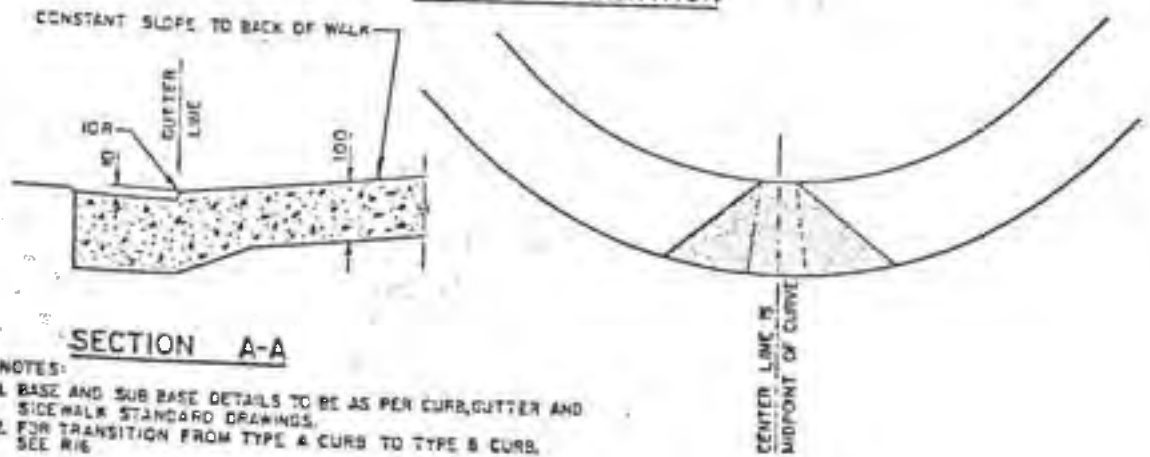
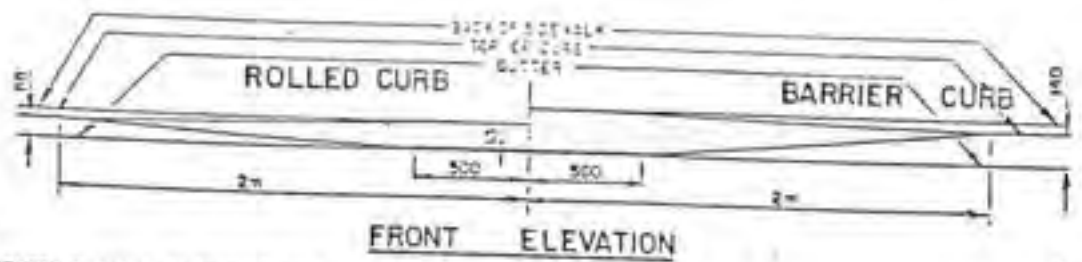
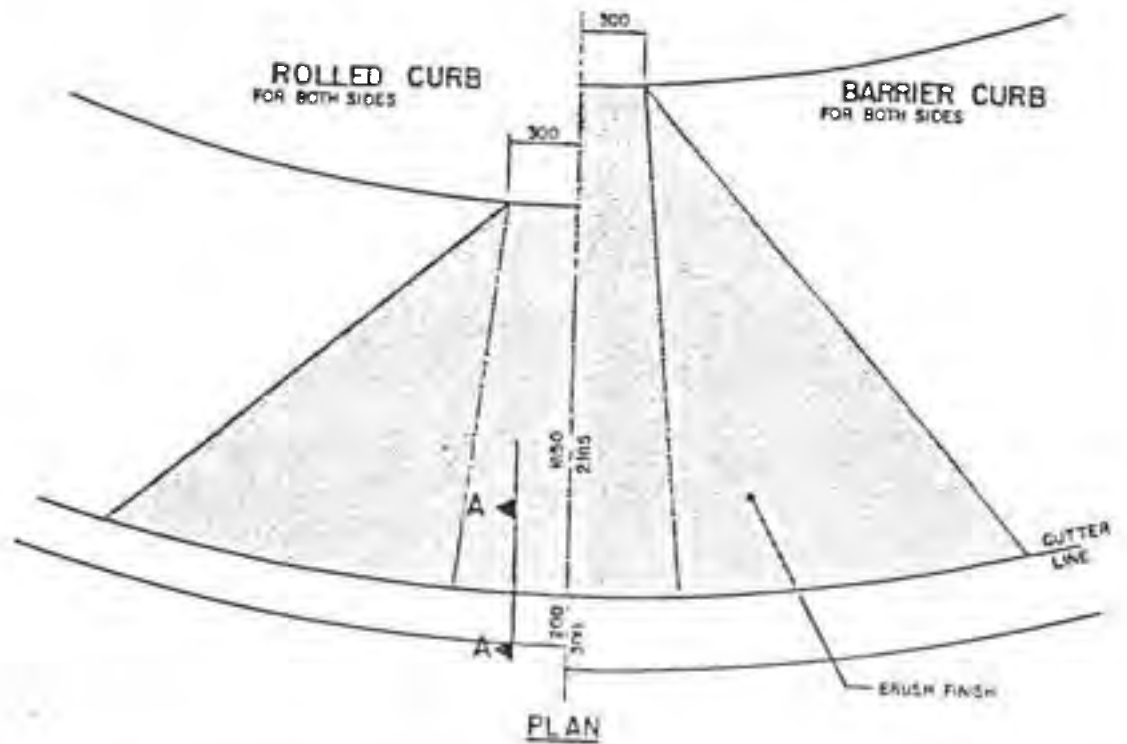
VILLAGE OF PORT CLEMENT
SIDEWALK CROSSING FOR
BARRIER CURB

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NOTE USE 1/2 ROLLED CURB & 1/2 BARRIER CURB TO FORM
TRANSITION BETWEEN CURBS

 Stanley STANLEY ASSOCIATES ENGINEERING LTD			VILLAGE OF PORT CLEMENT	
			TRANSITION CURB	
REV'N	DATE	DATE	APPROVED	DWG. NO. R



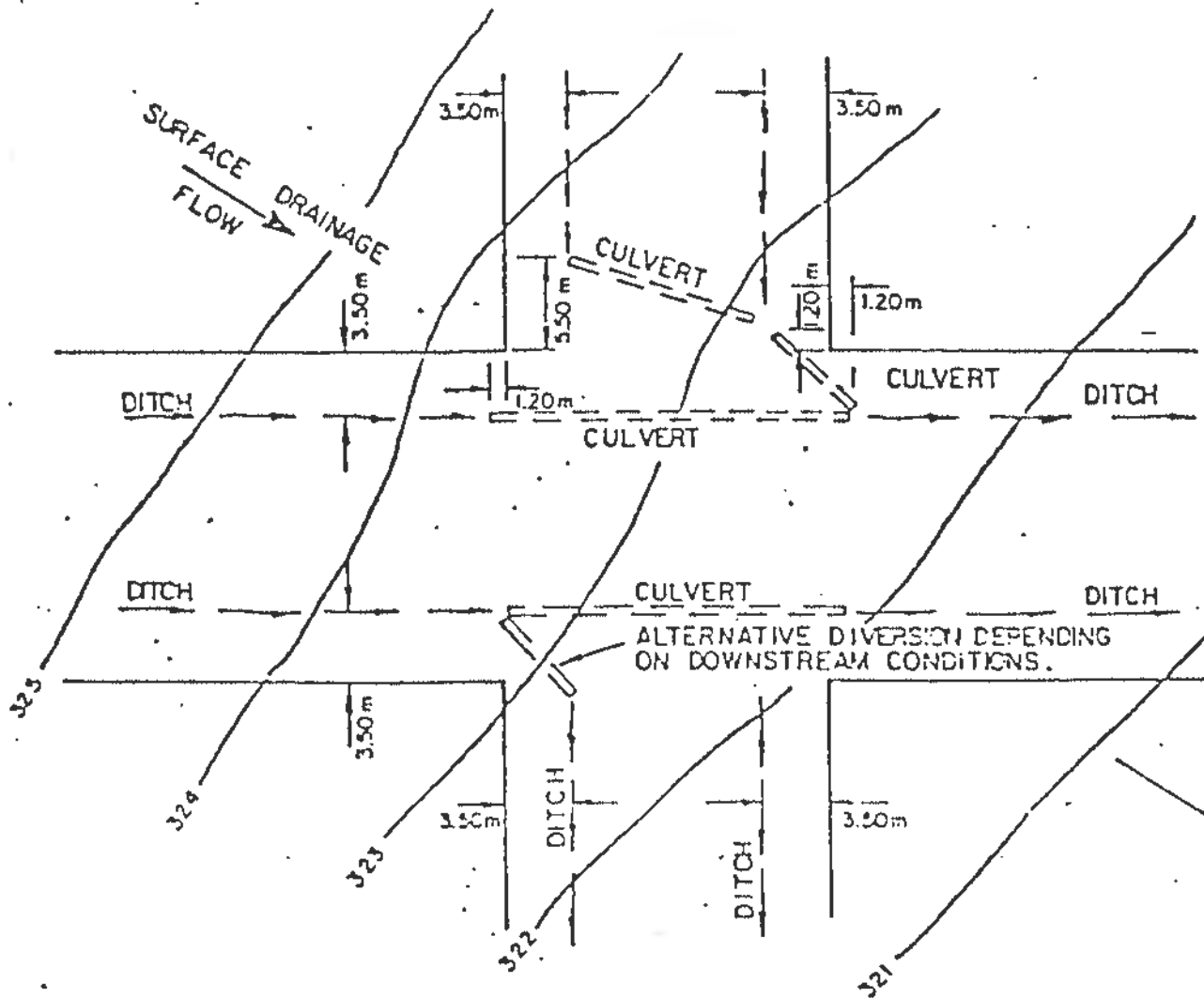
- NOTES:
1. BASE AND SUB BASE DETAILS TO BE AS PER CURB, GUTTER AND SIDEWALK STANDARD DRAWINGS.
 2. FOR TRANSITION FROM TYPE A CURB TO TYPE B CURB, SEE R16.



VILLAGE OF PORT CLEMEN


WHEELCHAIR RAMP

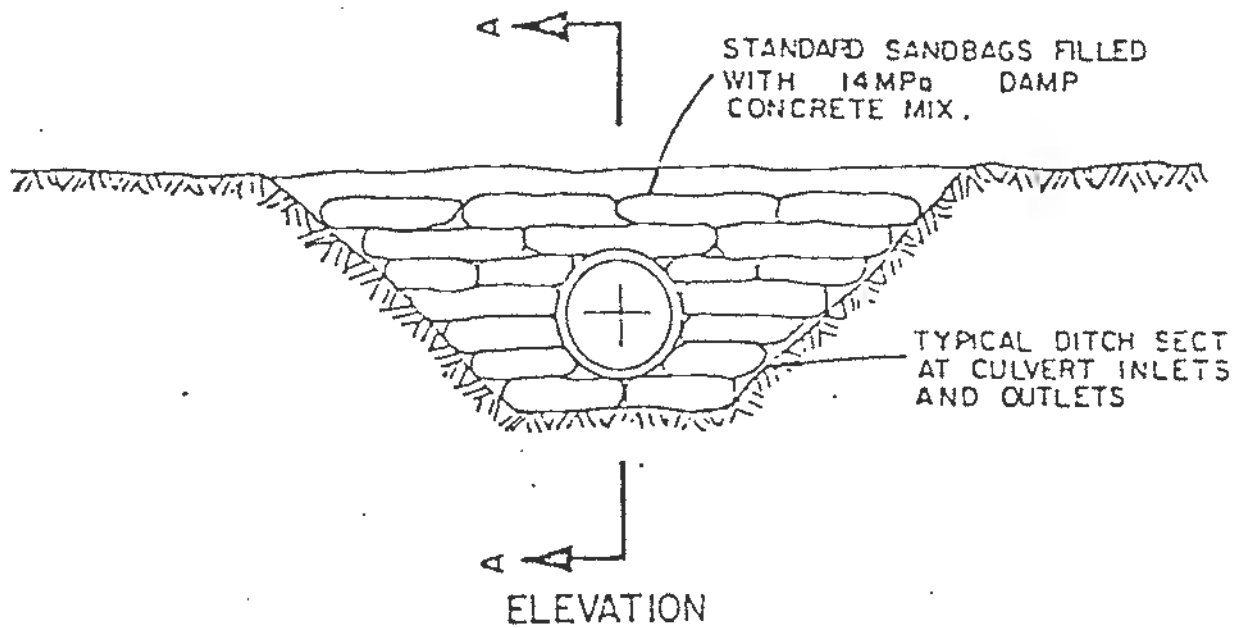
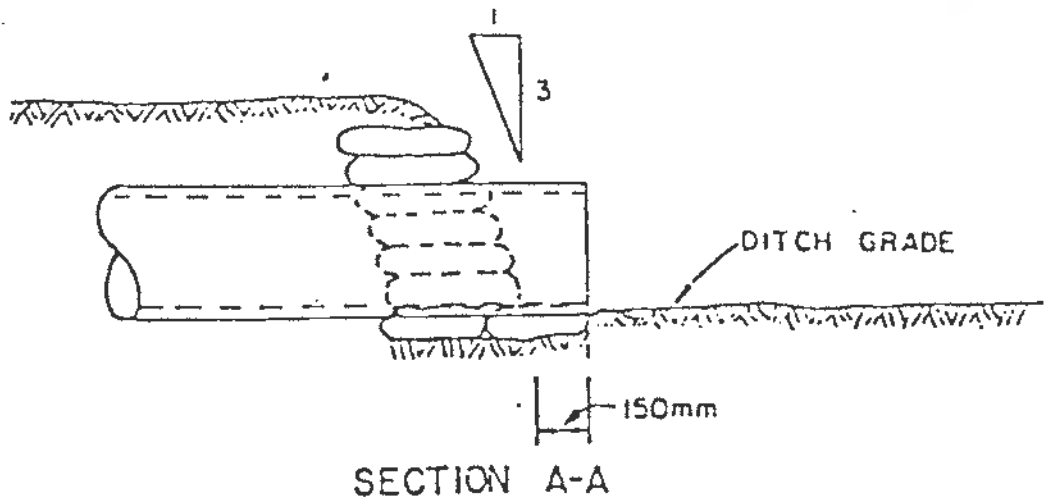
REV'N	DATE	DATE	APPROVED	DWG. NO.
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NOTES:


1. MINIMUM DIAMETER FOR ALL CULVERT PIPE TO BE 300 mm
2. APPROVED PIPE: (i) GALVANIZED CORRUGATED STEEL WITH RIVETED OR LOCK SEAMS, GALGES AS SPECIFIED UNDER MATERIALS
(ii) CONCRETE WITH GASKETS AS SPECIFIED UNDER MATERIALS.
3. SAND OR GRAVEL (25mm MINUS) BEDDING REQUIRED FOR ALL CULVERT INSTALLATIONS
4. IF THE HORIZONTAL DIRECTION OF FLOW AT CULVERT INLETS AND OUTLETS EXCEEDS 30°, THE SANDBAG BULKHEADS REQUIRE CURVED WING WALLS TO FUNNEL THE FLOW.

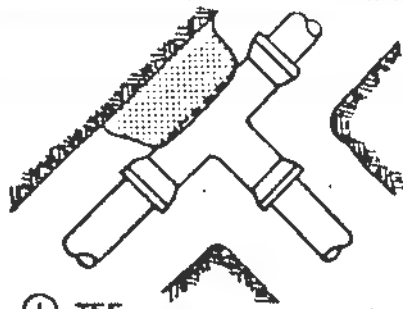
 Stanley STANLEY ASSOCIATES ENGINEERING LTD			VILLAGE OF PORT CLEMEN		
			TYPICAL CULVERT INSTALLATIONS		
	REV/N	DATE	DATE	APPROVED	DWG NO.



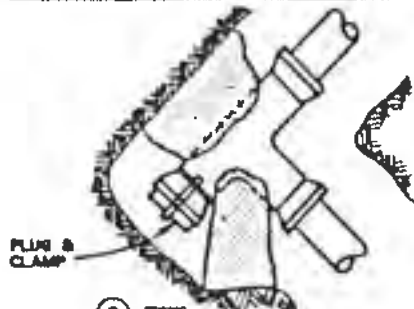
NOTES :

- IF THE HORIZONTAL DIRECTION OF FLOW AT CULVERT INLETS AND OUTLETS EXCEEDS 30° , THE SANDBAG BULKHEADS REQUIRE CURVED WING WALLS TO FUNNEL THE FLOW.

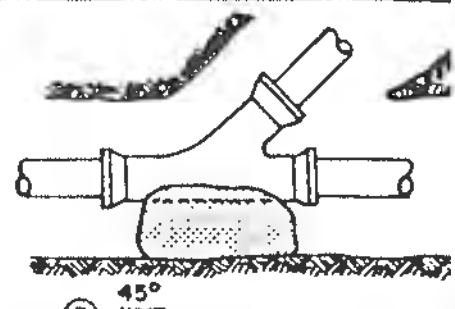
 Stanley STANLEY ASSOCIATES ENGINEERING LTD	VILLAGE OF PORT CLEMEN			
	SANDBAG BULKHEAD FOR CULVERT INLETS AND CUTLETS			
REV N	DATE	DATE	APPROVED	DWG NO



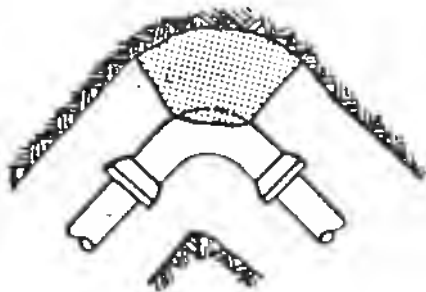
① TEE



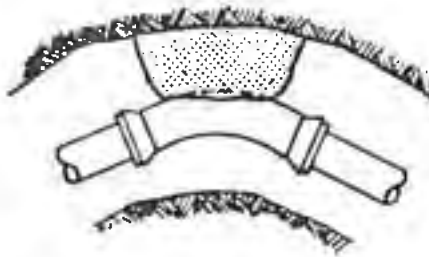
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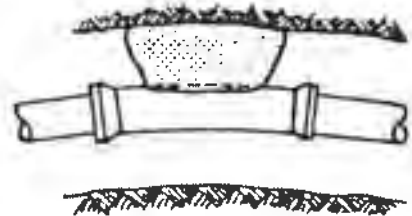
③ 45° WYE



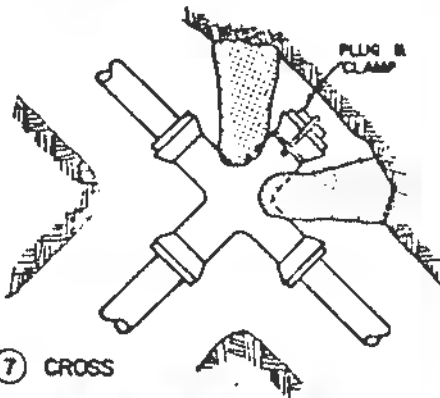
④ 90° BEND



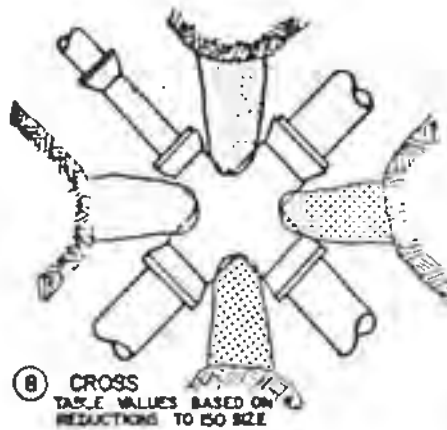
⑤ 45° BEND



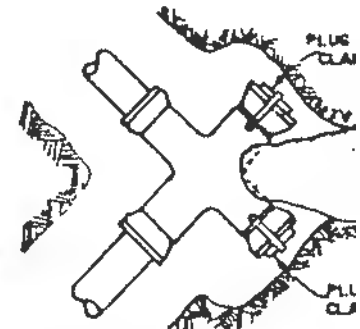
⑥ 22½° & 11¼° BEND



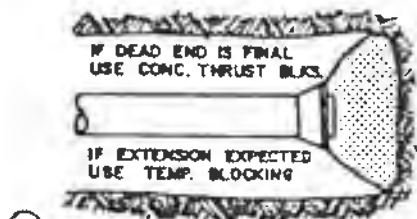
⑦ CROSS



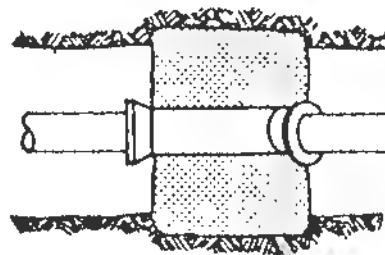
⑧ CROSS
TABLE VALUES BASED ON
REDUCTIONS TO ISO SIZE



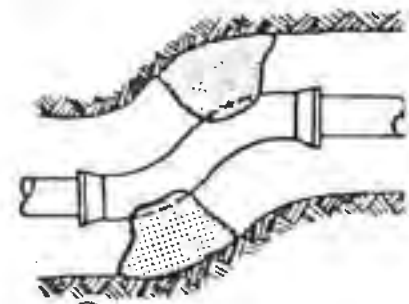
⑨ CROSS



⑩ PLUG



⑪ 45° VERTICAL SAG



⑫ OFFSET BEND

CONC. BEARING AREAS IN SQUARE METERS						
PIPE SIZE	100	150	200	250	300	400
1, 7, 10	0.2	0.4	0.7	1.0	1.4	1.8
2, 4, 8	0.3	0.5	0.9	1.4	2.0	2.8
3, 5, 11	0.1	0.3	0.5	0.8	1.0	1.4
6	0.1	0.1	0.3	0.4	0.6	0.7
9			0.2	0.5	0.7	1.6
12	0.3	0.6	1.0	1.2	2.2	2.9

NOTE: 1. DESIGN ASSUMPTIONS
 a) HYDRAULIC HEAD = 1500 kPa
 b) SOIL BEARING = 96 kPa (MED. SOFT CLAY)
 2. TEMPORARY BLOCKING MUST BE APPROVED BY THE ENGINEER
 3. FOR PIPE SIZES NOT IN TABLE, SEE SPECS.

CONCRETE : 25 mPa @ 28 DAY STRENGTH (TYP.)



VILLAGE OF PORT CLEMEN

THRUST BLOCKS

REV. N

DATE

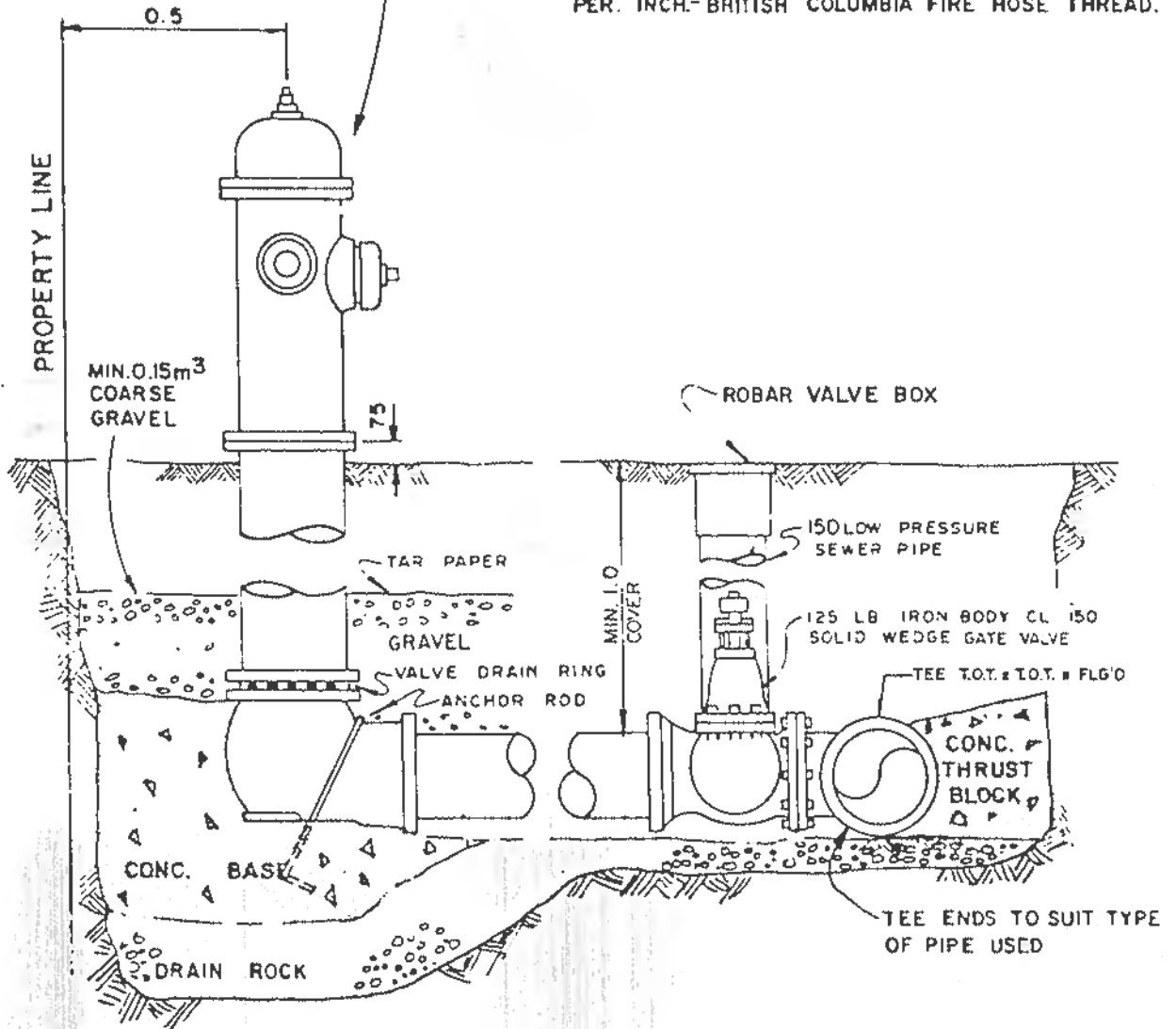
DATE

APPROVED

DWG No

FIRE HYDRANTS SHALL BE
COMPRESSION TYPE
AND SHALL CONTAIN:

- A. PUMPER PORT - N.F.P.A. STANDARD 100 I.D. & 125 O.D. - FOUR (4) THREADS PER. INCH AMERICAN NATIONAL FIRE HOSE COUPLING THREAD.
- B. 2 HOSE OUTLETS - 63^Ø NOMINAL I.D. - 8 THREADS PER. INCH - BRITISH COLUMBIA FIRE HOSE THREAD.



NOTES:

1. BEARING AREA OF THRUST BLOCK TO BE MIN. OF 0.5m²
2. DRAIN HOLES TO BE PLUGGED IN AREAS OF HIGH WATER TABLE.
3. HYDRANT TO BE INSTALLED WITH PUMPER PORT FACING STREET.



Stanley

STANLEY ASSOCIATES ENGINEERING LTD.

VILLAGE OF PORT CLEMEN

FIRE HYDRANT ASSEMBLY

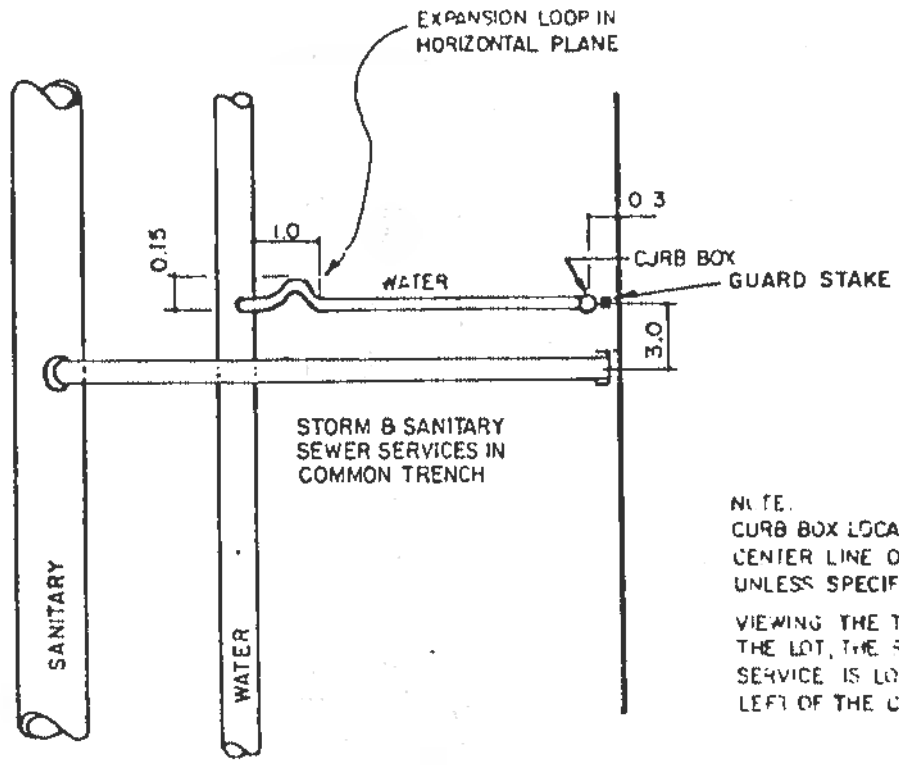
REV, N

DATE

DATE

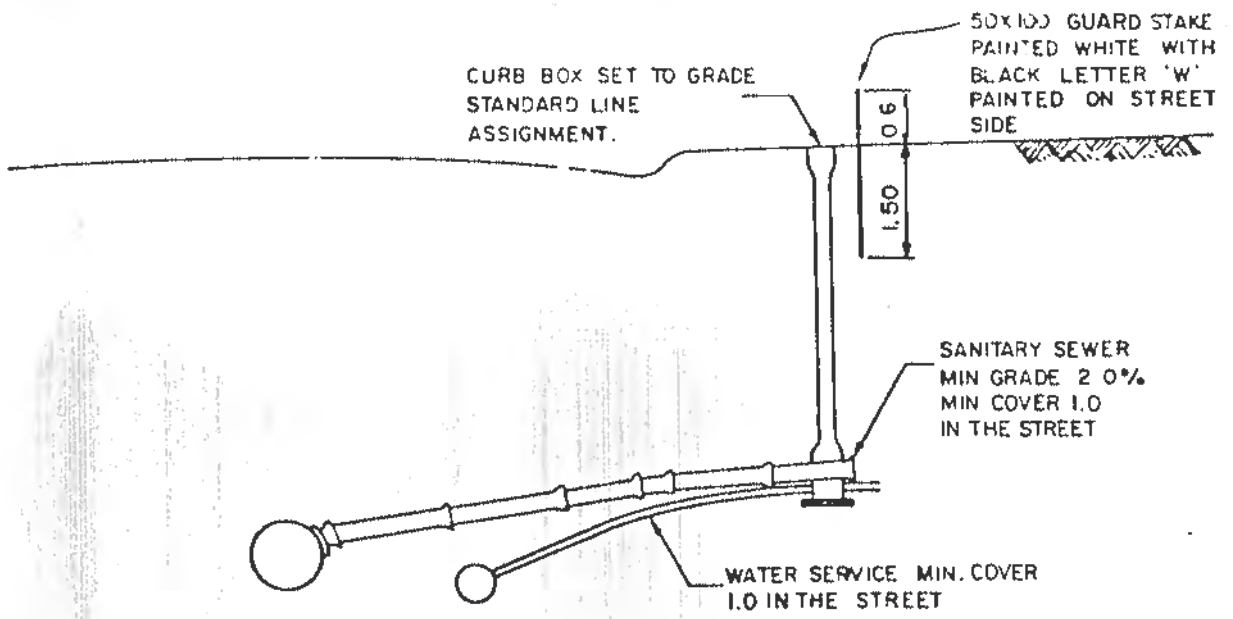
APPROVED

DWG No




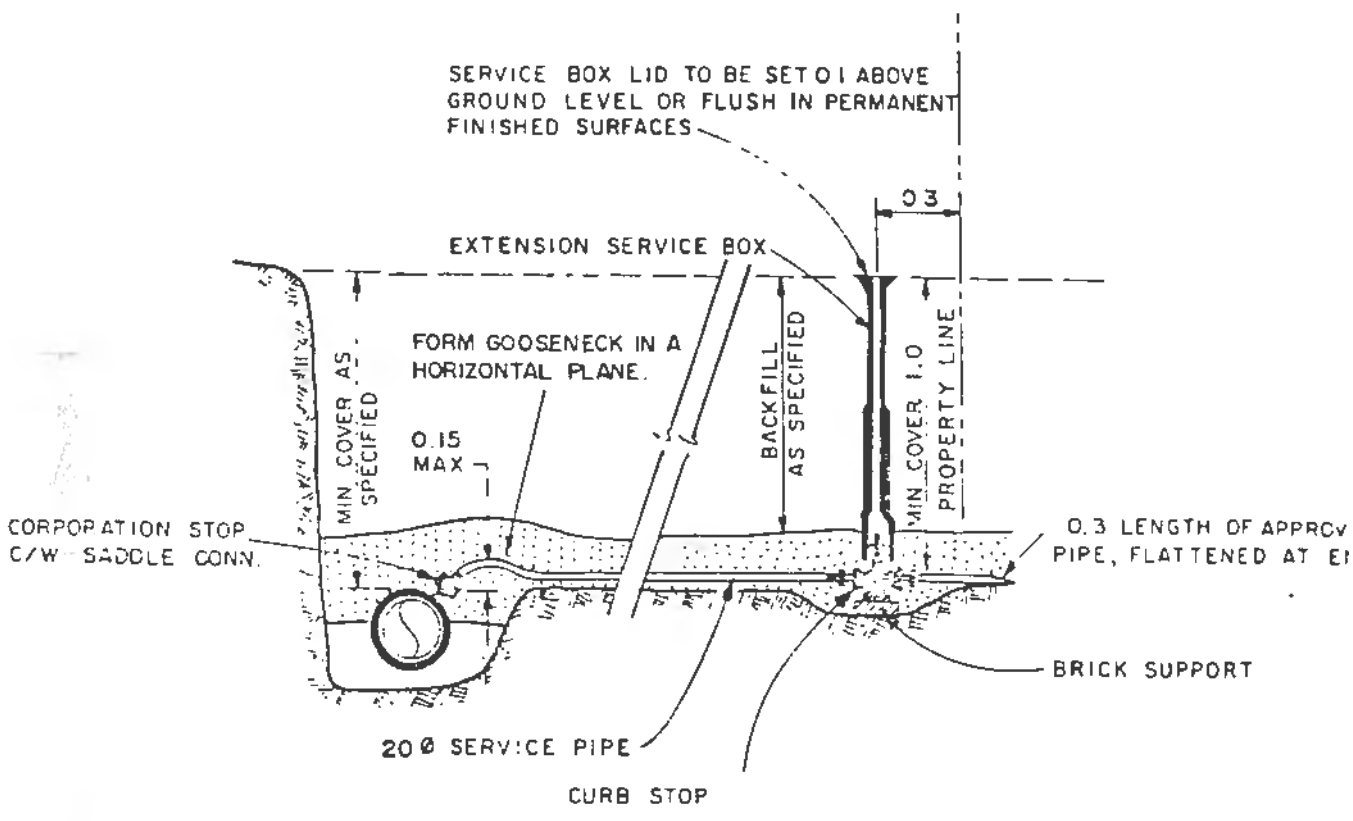
NOTE:
 CURB BOX LOCATED ON
 CENTER LINE OF LOT
 UNLESS SPECIFIED OTHERWISE
 VIEWING THE TRENCH FROM
 THE LOT, THE SANITARY SEWER
 SERVICE IS LOCATED TO THE
 LEFT OF THE CURB BOX


PLAN

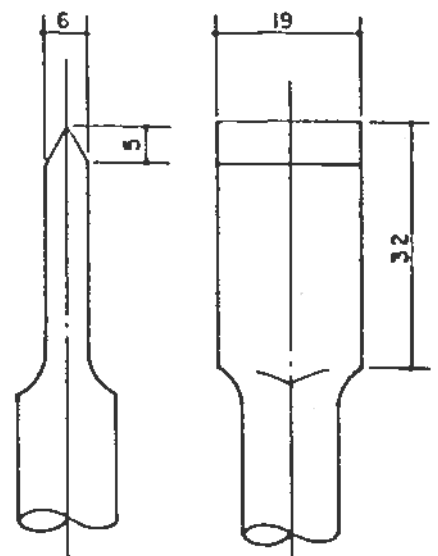
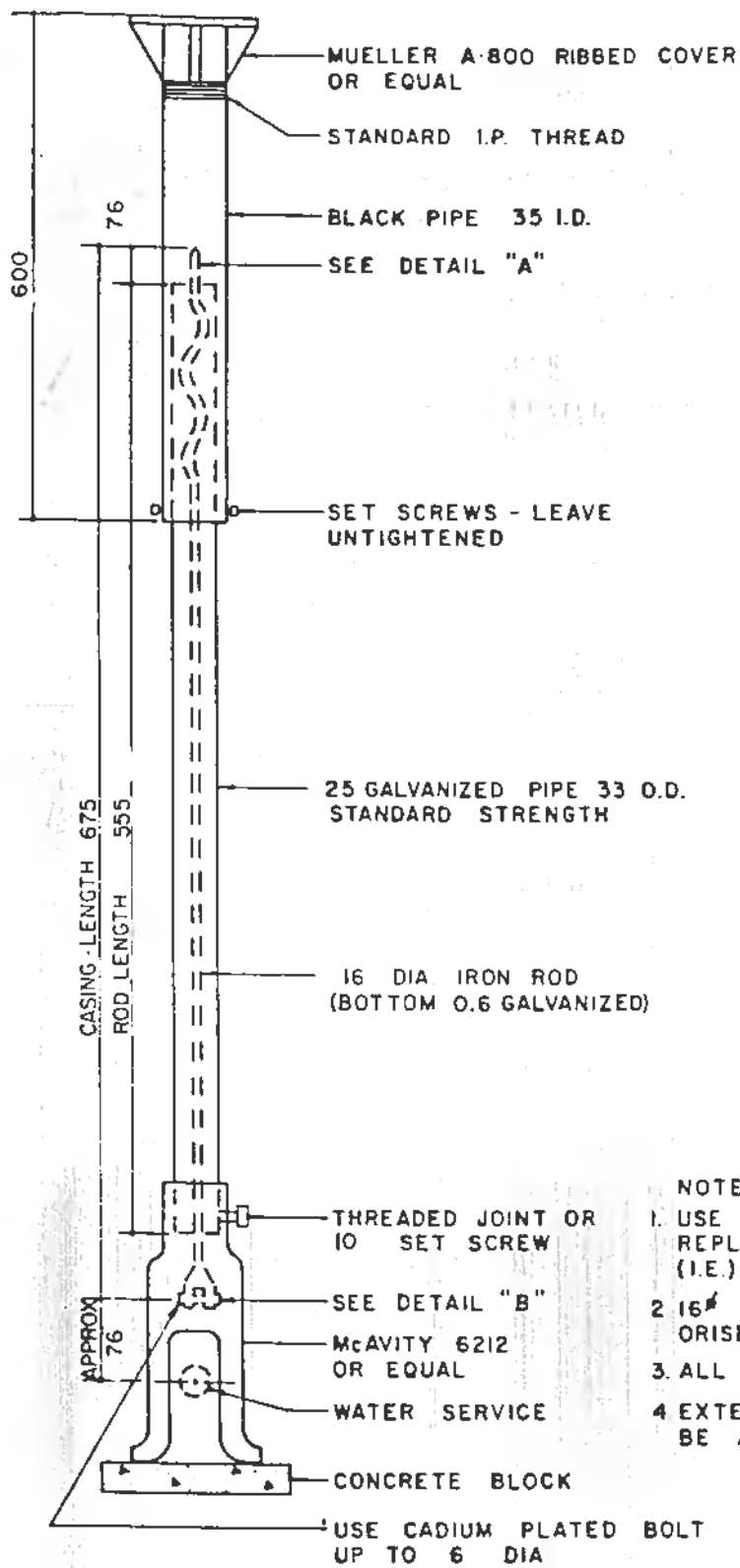


ELEVATION

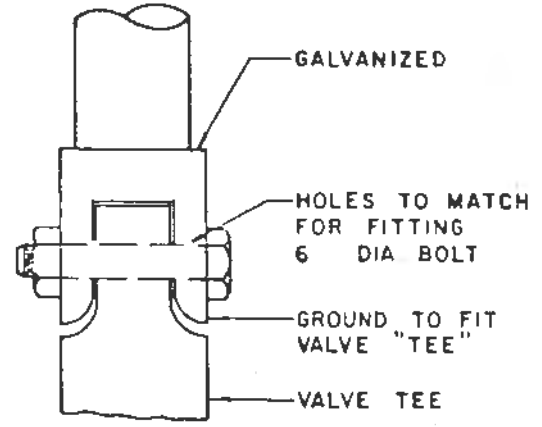
 Stanley STANLEY ASSOCIATES ENGINEERING LTD.	VILLAGE OF PORT CLEMEN			
	SEWER & WATER SERVICES			
REV. N	DATE	DATE	APPROVED	DWG. NO.



 Stanley STANLEY ASSOCIATES ENGINEERING LTD.		VILLAGE OF PORT CLEMENT	
		WATER SERVICE CONNECTION DET	
REV,N	DATE	DATE	APPROVED
			DWG. No.



DETAIL "A"



DETAIL "B"

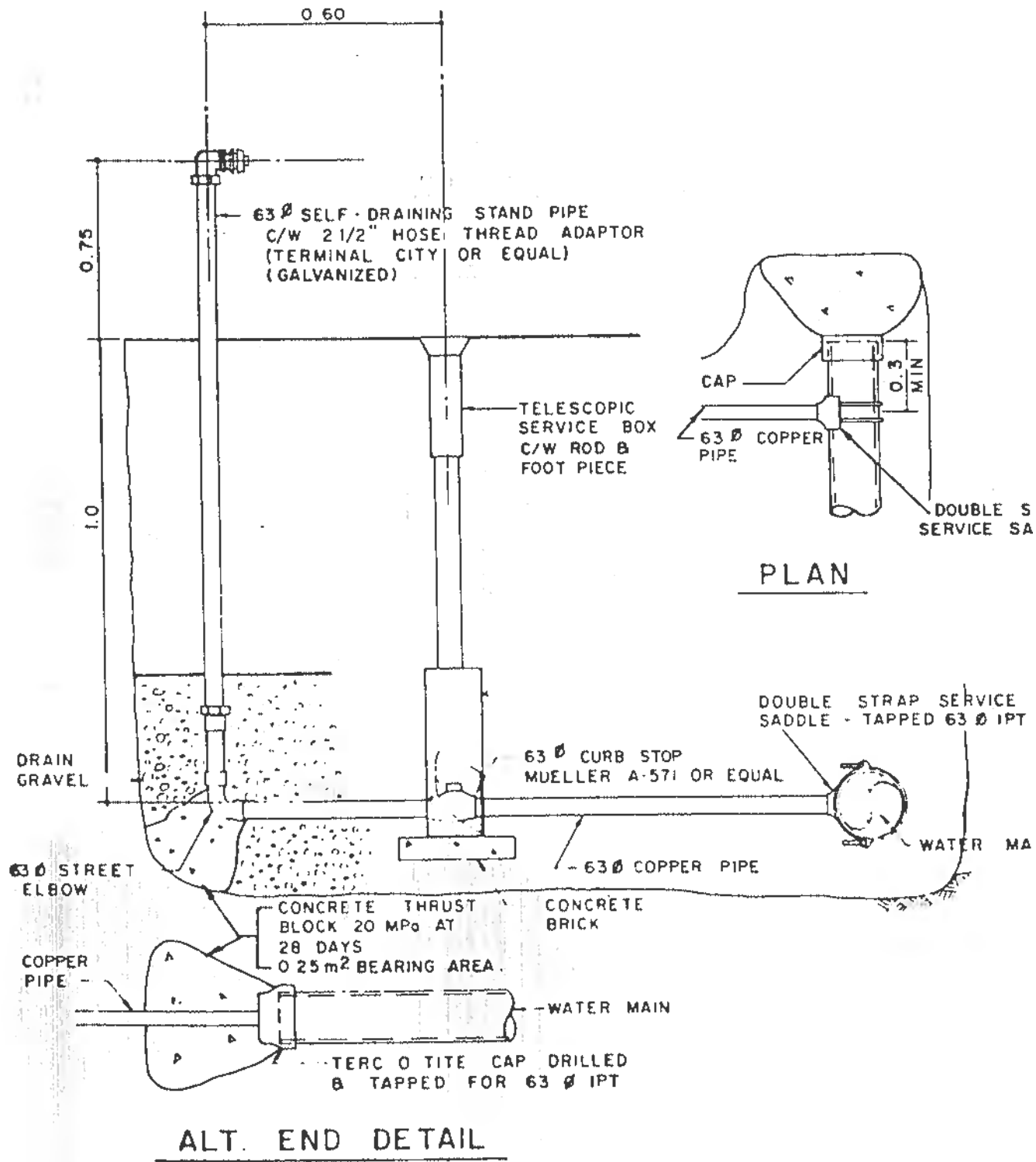
- NOTES
1. USE 19" STRAIGHT SERVICE RODS WHEN REPLACEMENT OF 16" ROD IS REQUIRED (I.E.) FOR OLD CURB COCKS
 2. 16" SERVICE RODS TO BE USED FOR ORISEAL CURB COCKS
 3. ALL DIMENSIONS BASED ON 1.0m COVER
 4. EXTENSION SERVICE BOX MUST BE ADJUSTABLE




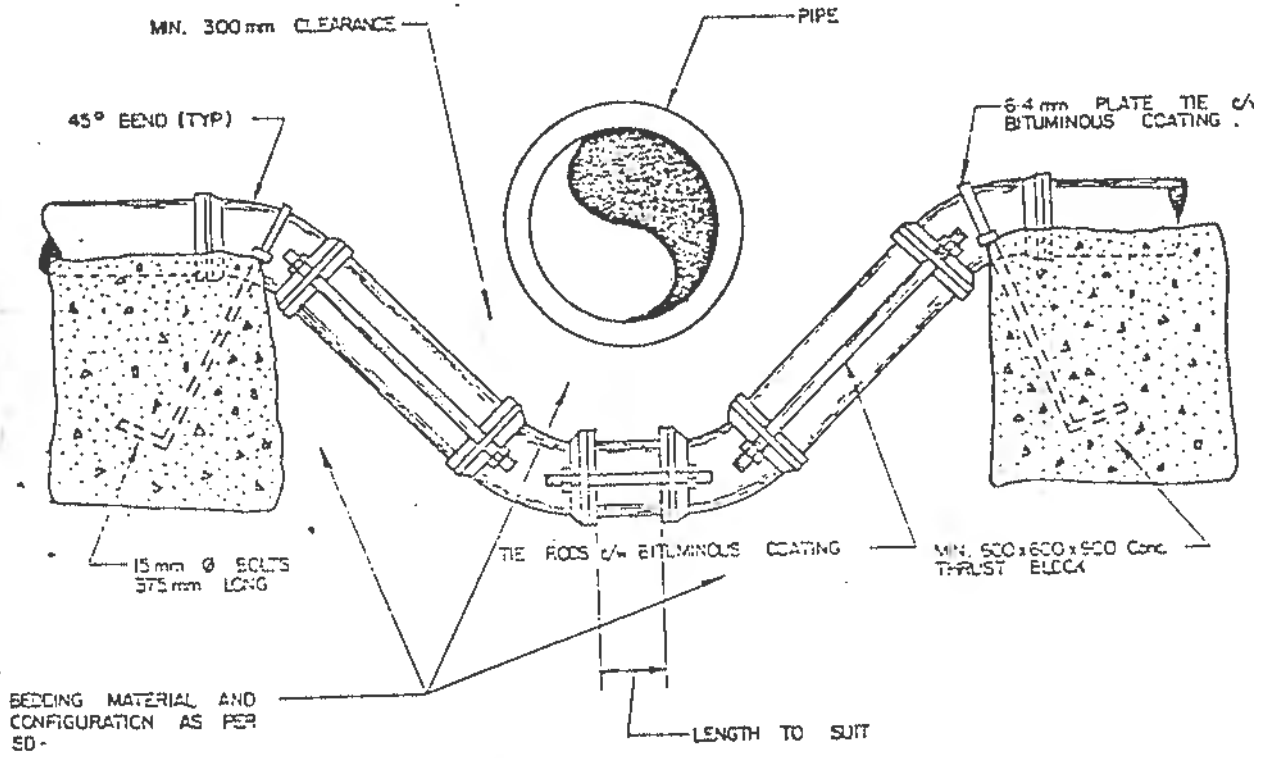
VILLAGE OF PORT CLEMEN

EXTENSION SERVICE BOX DETAIL

REV. N	DATE	DATE	APPROVED	DWG. No.
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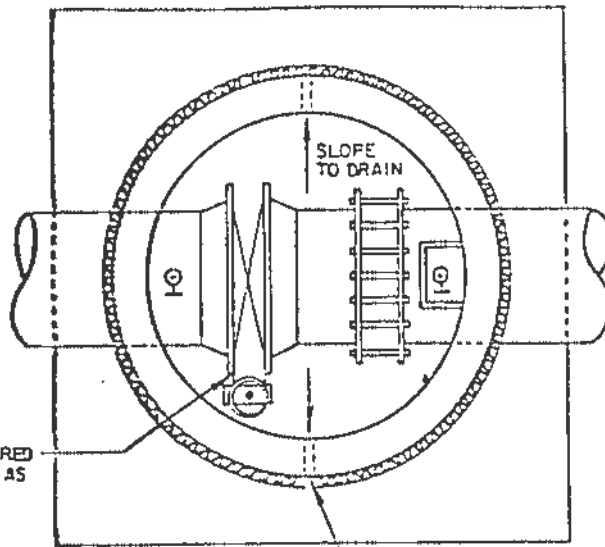
 Stanley STANLEY ASSOCIATES ENGINEERING LTD		VILLAGE OF PORT CLEMENT		
		STAND PIPE DETAIL		
REV N	DATE	DATE	APPROVED	DWG. No.



NOTES:

1. CONCRETE TO BE 25MPa COMPRESSIVE STRENGTH AT 28 DAYS.

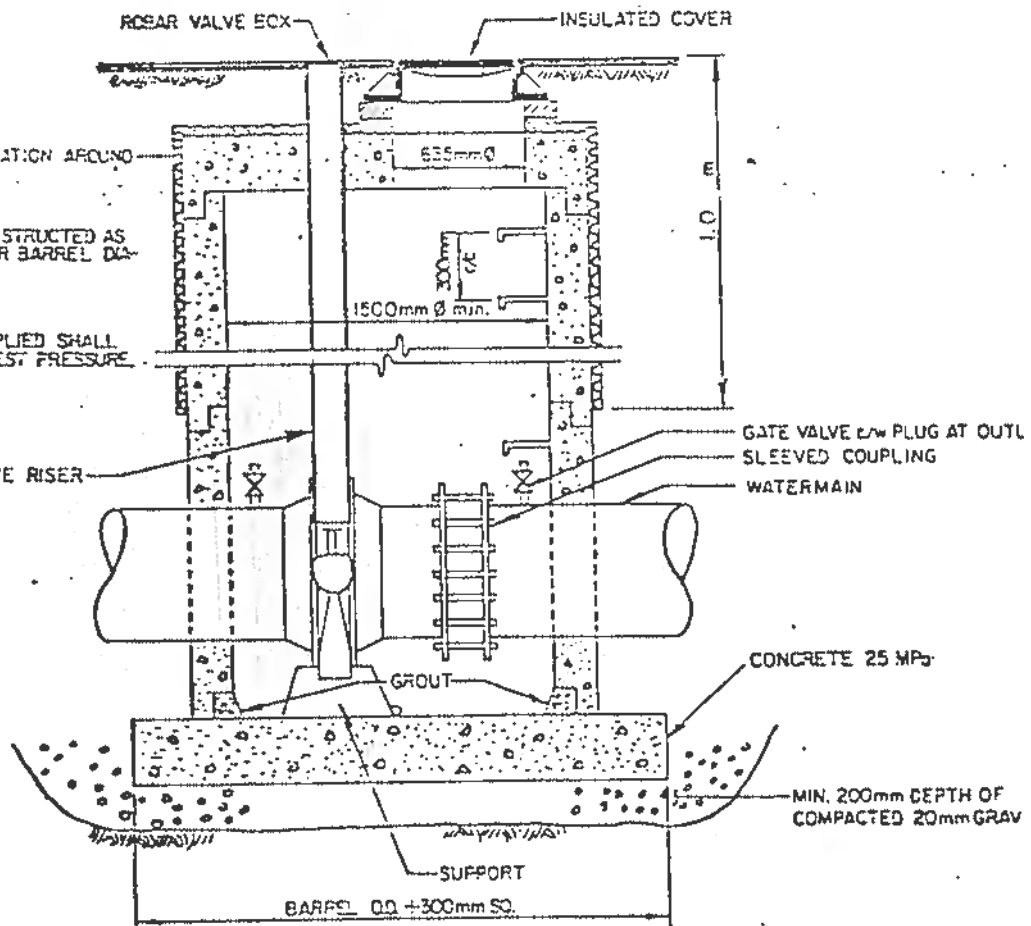
 Stanley STANLEY ASSOCIATES ENGINEERING LTD		VILLAGE OF PORT CLEMEN	
		WATERMAIN RELOCATION	
REV'N	DATE	DATE	APPROVED
			DWG.NO.



BUTTERFLY VALVE w/ GEARED OPERATOR (HEAVY DUTY) OR AS APPROVED.

50mm DRAIN HOLE.
0.5 m³ DRAIN ROCK AT EACH DRAIN. (MIN.)

PLAN



STYROFOAM S.M. INSULATION AROUND MANHOLE.

NOTE:

1. MANHOLE TO BE CONSTRUCTED AS PER S-1 EXCEPT FOR BARREL DIAMETER.

2. ALL EQUIPMENT SUPPLIED SHALL BE ADEQUATE FOR TEST PRESSURE.

SECTION



Stanley

STANLEY ASSOCIATES ENGINEERING LTD.

VILLAGE OF PORT CLEMEN

BUTTERFLY VALVE CHAMBER

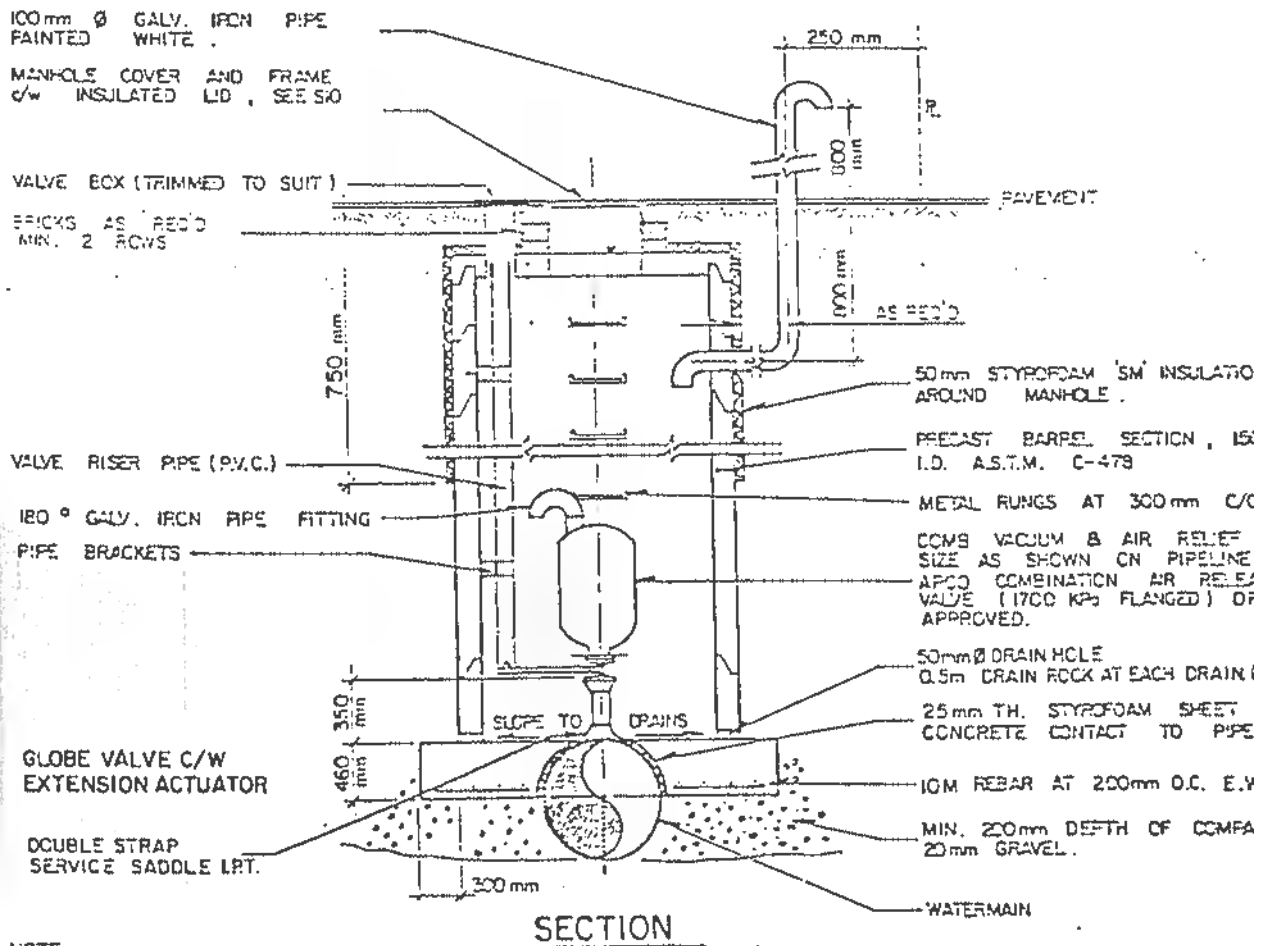
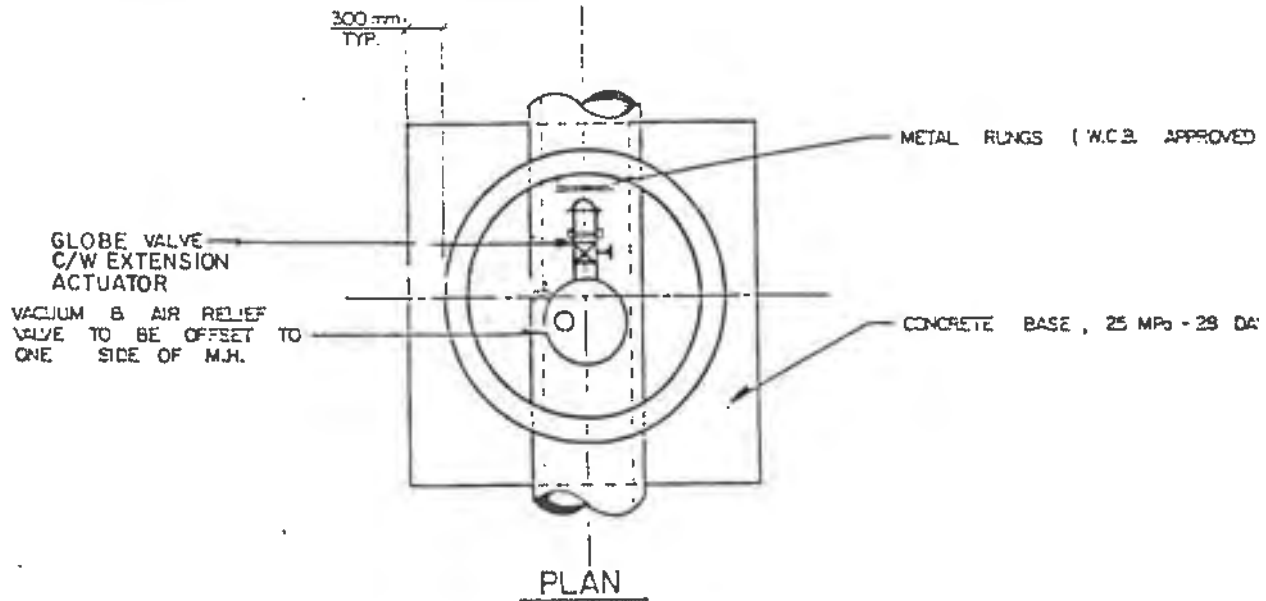
REV'N

DATE

DATE


APPROVED

DWG.NO.



NOTE :

ALL INTERIOR PIPE FITTINGS ARE TO BE COATED WITH 2 COATS OF TARMASTIC 101 BITUMINOUS PAINT OR AS APPROVED AFTER WIRE BRUSHING THESE FITTINGS

 Stanley STANLEY ASSOCIATES ENGINEERING LTD	VILLAGE OF PORT CLEMEN			
	AIR RELEASE VALVE CHAMBER			
REV N	DATE	DATE	APPROVED	DWG. NO.

FOR SEWER DEPTH OF 2.00 OR LESS USE PRECAST CONC. FLAT SLAB LID.

MANHOLE FRAME & COVER

CONC. RING OR CONC. BRICKS (MIN. TWO COURSES OF BRICKS)

PRECAST ECCENTRIC REDUCER CONE

PRECAST 1050 # BARREL SECTION (NOTE 1)

19# GALV. STL. ROD

WHERE POSSIBLE USE HALF SECTIONS OR BREAK OUT TOP HALF OF PIPE

MANHOLE RUNGS AT 0.30 O.C.

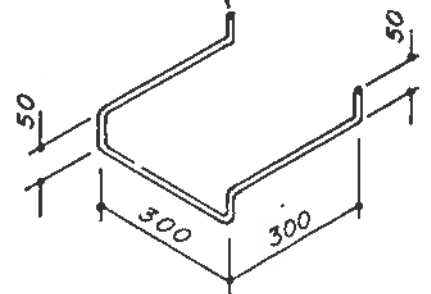
BENCHING SHALL BE SMOOTH STEEL TROWELLED MIN. SLOPE 0.1/1.0

(NOTE 2)

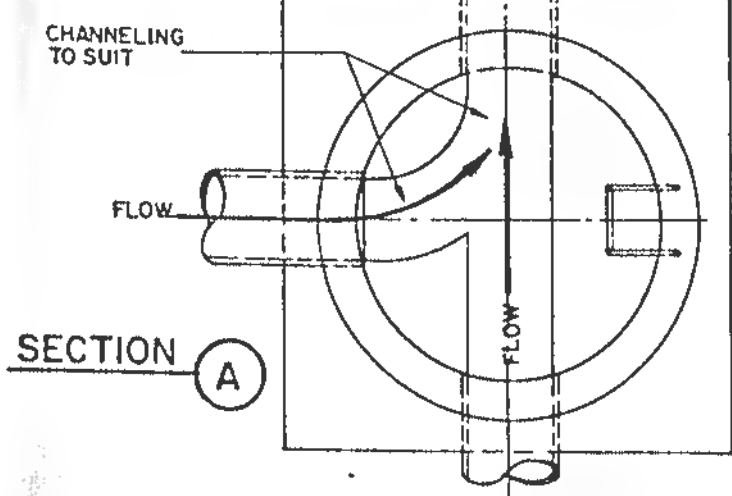
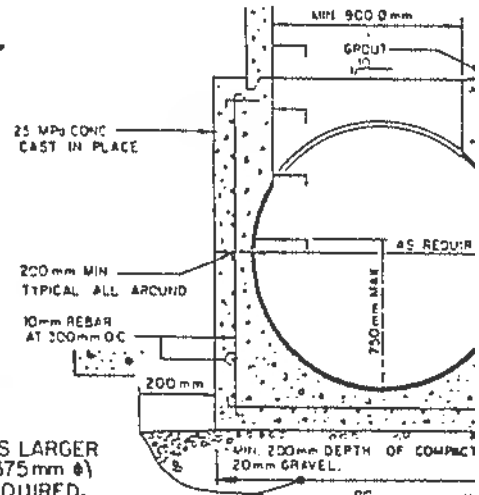
1.6 SQ. CONC. BASE

GRAVEL BASE MIN 200mm DEPTH COMPACTED TO 95% OF STANDARD PROCTOR DENSITY

(SEWERS LARGER THAN 375mm Ø) AS REQUIRED



MANHOLE RUNG



NOTES

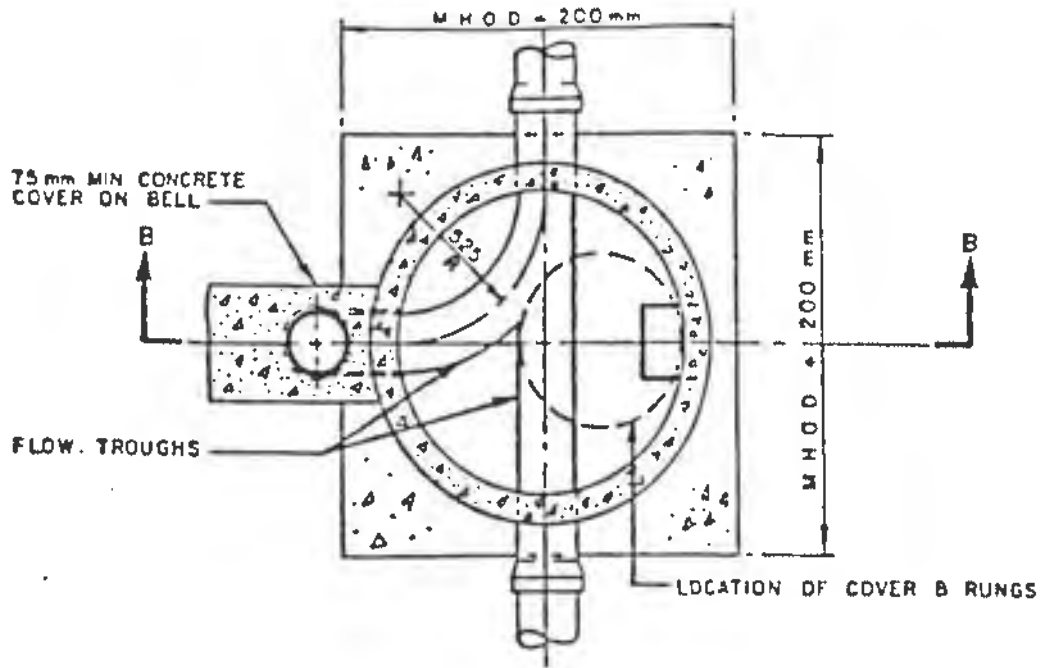
1. PRECAST BARREL SECTIONS SHALL CONFORM TO A.S.T.M. SPEC. C 47B.
2. ALL CONNECTIONS OF LATERALS SHALL BE CROWN TO CROWN OR FOR PIPE OF THE SAME DIA. A MIN. OF 0.005 DROP IS REQ'D.
3. LOCATION OF MANHOLE COVER & FRAME TO SUIT MUNICIPAL STANDARDS.
4. IN OPEN FIELD TOP OF MANHOLE COVER SHALL BE MIN. 0.75 ABOVE EXIST. GROUND.
5. ALL JOINTS MUST BE MORTAR FINISH & WATERTIGHT.



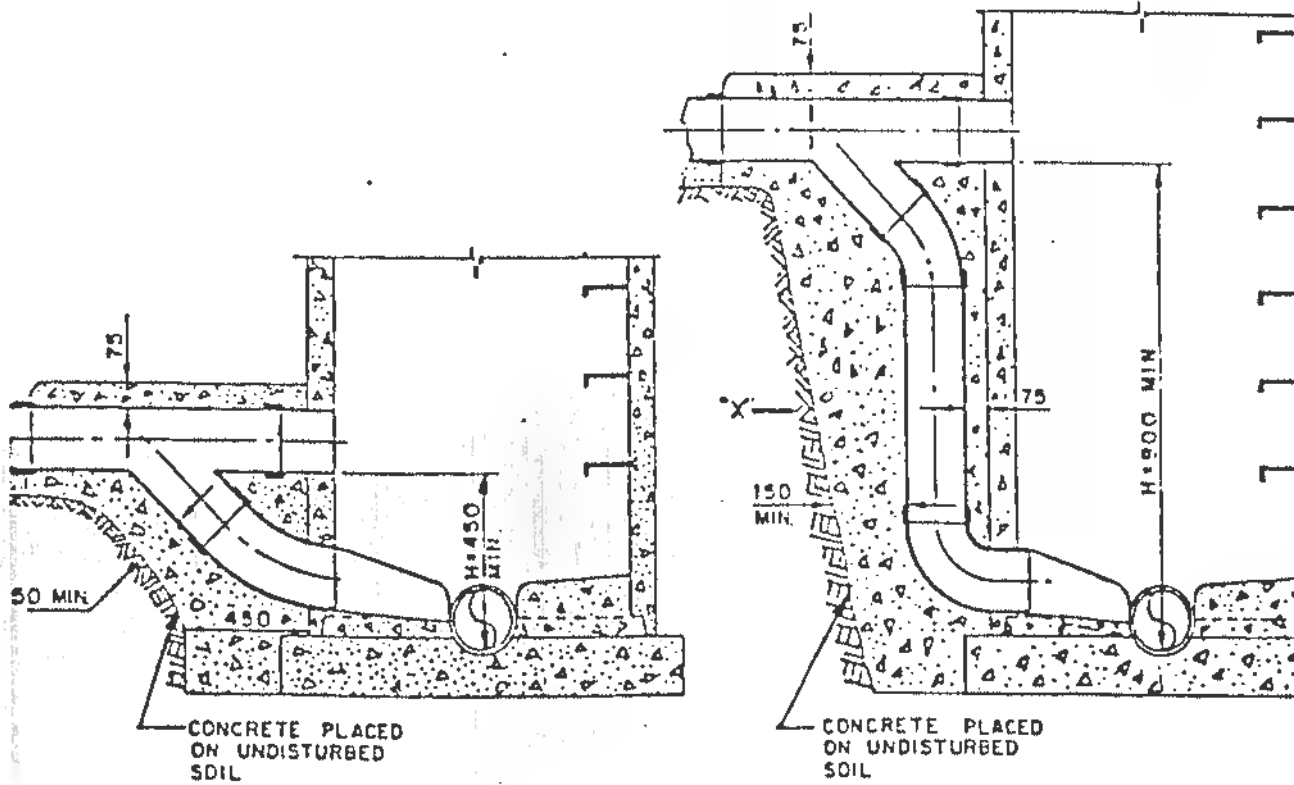
VILLAGE OF PORT CLEMENTE

STANDARD MANHOLE

1	JUNE '89			
REV. N	DATE	DATE	APPROVED	DWG. No.



PLAN AT "X-X" SHOWING DROP



NOTES:

1. FOR DETAILS ON CONE TYPE MANHOLES SEE DRAWING S
2. SEE DWG. No. S1453 FOR DETAILS ON INVERT CHANNELLING IN MANHOLE.
3. ALL DIMENSIONS ARE GIVEN IN millimetres UNLESS OTHERWISE INDICATED.



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VILLAGE OF PORT CLEMEN

EXTERIOR DROP MANHOLE

REV,N

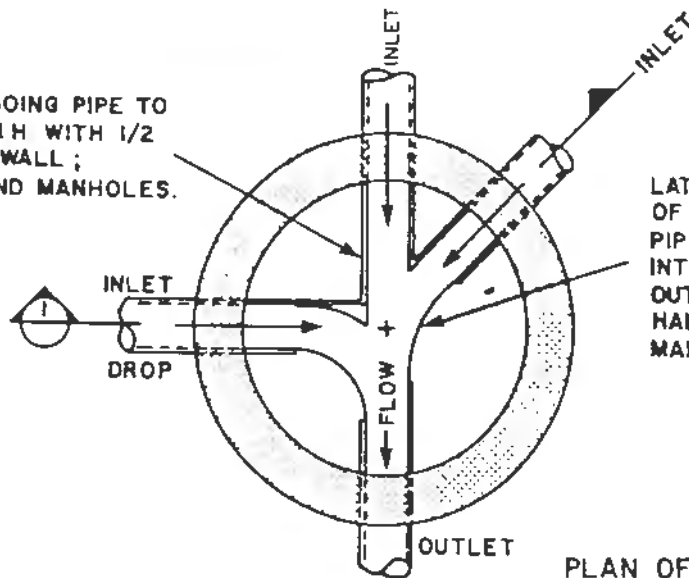
DATE

DATE

APPROVED

DWG No

IN ALL CASES, OUTGOING PIPE TO GO STRAIGHT THRU M.H. WITH 1/2 PIPE TO OPPOSITE WALL; INCLUDING DEAD END MANHOLES.

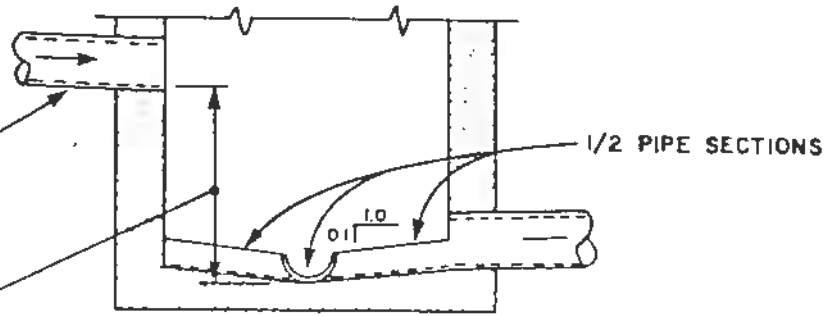


LATERALS WITH AN INTERSECTION OF 90° OR LESS TO THE INLET PIPE ARE TO GO STRAIGHT TO THE INTERSECTION WITH THE OUTGOING PIPE WITH A HALF PIPE SET IN MAIN BENCHING.

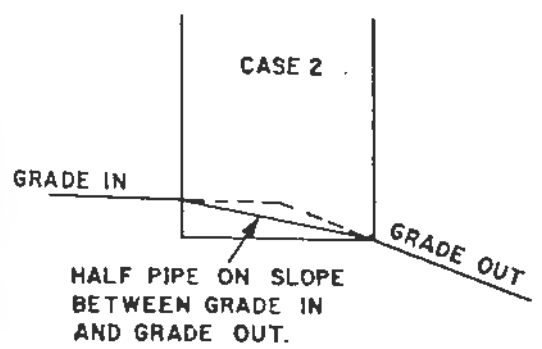
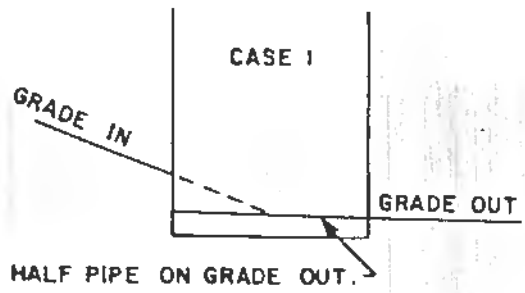
PLAN OF MANHOLE

INLET FLOW DROPS INTO HALF PIPE SET INTO MAIN BENCHING.

0.60 MAX FOR SANITARY MANHOLES.
2.50 MAX. FOR STORM MANHOLES.

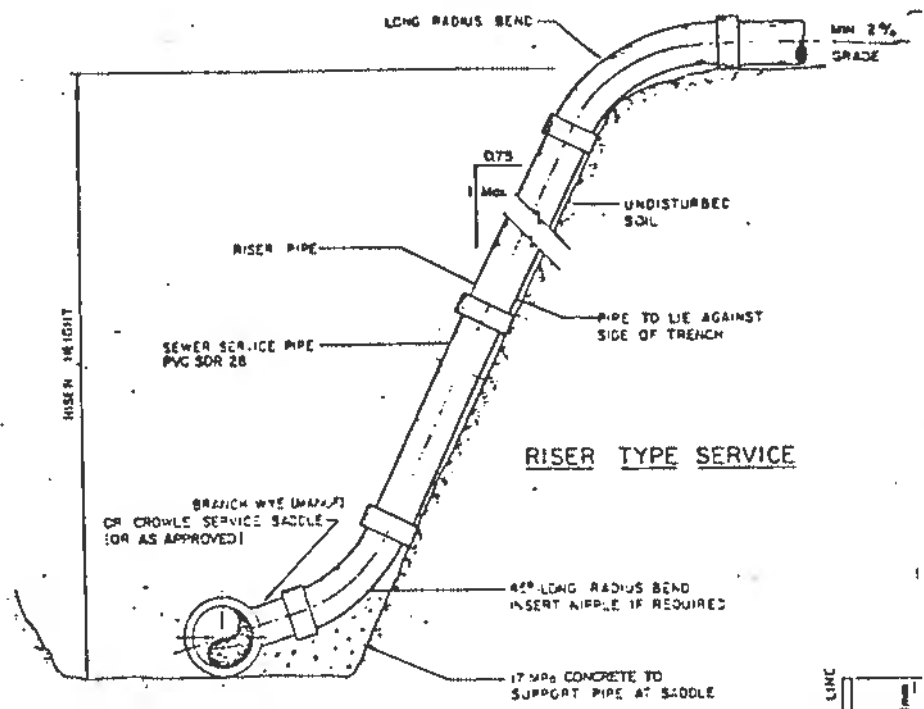


SECTION THRU MANHOLE (1)



VILLAGE OF PORT CLEMENT
MANHOLE BENCHING

REV, N	DATE	DATE	APPROVED	DWG. No.
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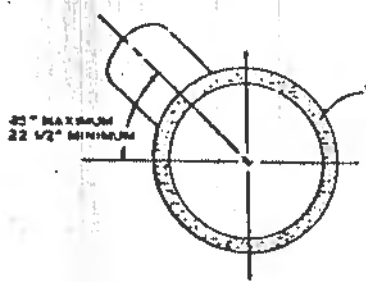
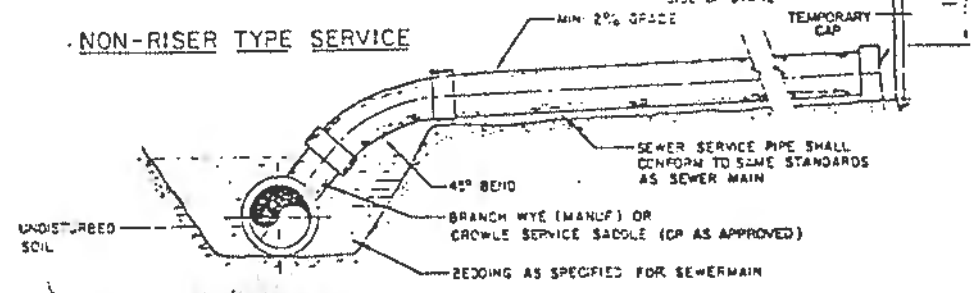
RISER TYPE SERVICE

NOTES

- 1 SEWER SERVICE LINES SHALL HAVE A MINIMUM DEPTH OF COVER OF 1800 mm AT PROPERTY LINE.
- 2 WHEREVER POSSIBLE, SEWER AND WATER SERVICE LINES SHALL BE INSTALLED IN THE SAME TRENCH

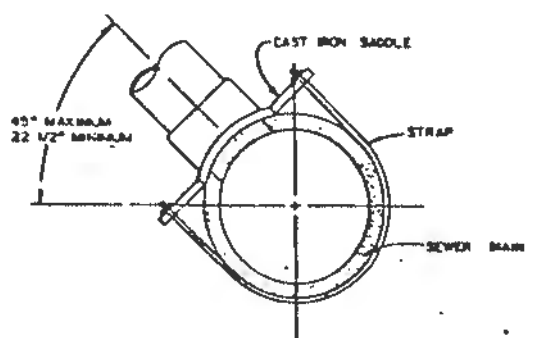
40 mm x 90 mm STAKE PAINTED WHITE WITH CONTRASTING BLOCK LETTER "S" POINTED ON STREET SIDE OF STAKE

NON-RISER TYPE SERVICE




**WYE CONNECTION
(TO NEW SEWER MAINS)**

NON. E. OF SERVICE IS AT 45° ANGLE TO SEWER MAIN IF WYE USED.



**SADDLE CONNECTION
(TO EXISTING SEWER MAINS)**

 Stanley STANLEY ASSOCIATES ENGINEERING LTD.	VILLAGE OF PORT CLEMEN			
	STANDARD SEWER CONNECTIONS			
REV'N	DATE	DATE	APPROVED	DWG. NO.

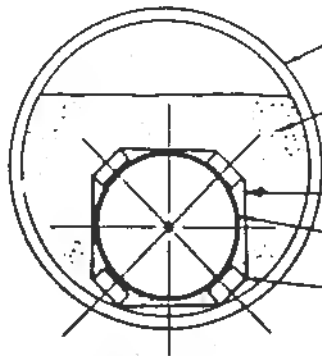
NOTES

SKIDS MUST BE EVENLY SPACED AROUND PIPES

- 4 SKIDS ARE REQ'D FOR PIPES 300 & UNDER
- 5 SKIDS FOR 350 - 400
- 6 SKIDS FOR 450 - 600
- 8 SKIDS FOR 750 AND OVER

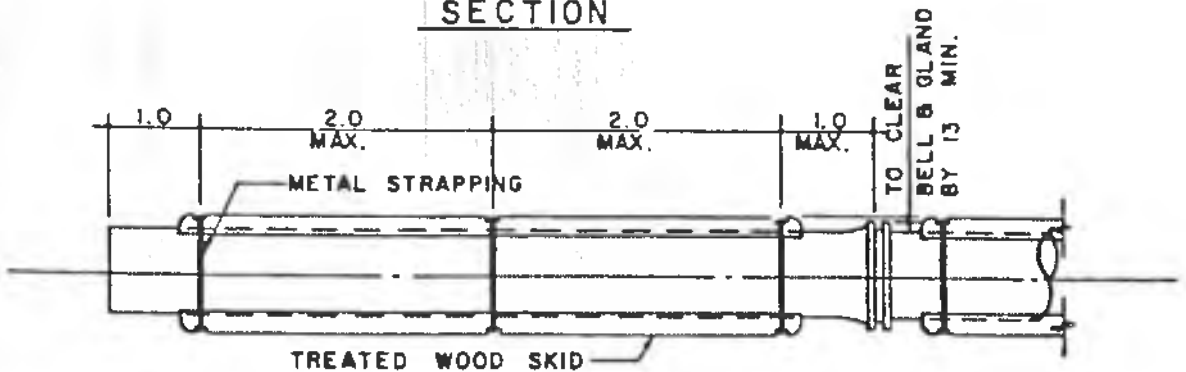
TABLE OF CASING SIZES	
PIPE SIZE	CASING SIZE
DIA IN mm	DIA. IN mm
75	225
100	250
150	300
200	400
250	450
300	500
350	550
400	600
450	650
500	700
600	875
675	975
750	1075
850	1150
900	1225
1000	1375
1075	1450

**DUCTILE
IRON
AND
ASBESTOS
CEMENT
PIPES**



- STD. WT STEEL ENCASEMENT PIPE MIN. YIELD STRENGTH 240 MPa
- SAND BACKFILL TO 1/8 OF ENCASEMENT PIPE DIA. PLACED HYDRAULICALLY
- METAL STRAPPING OR A.G.
- SERVICE PIPE
- TREATED WOOD SKIDS - SEE BELOW

SECTION

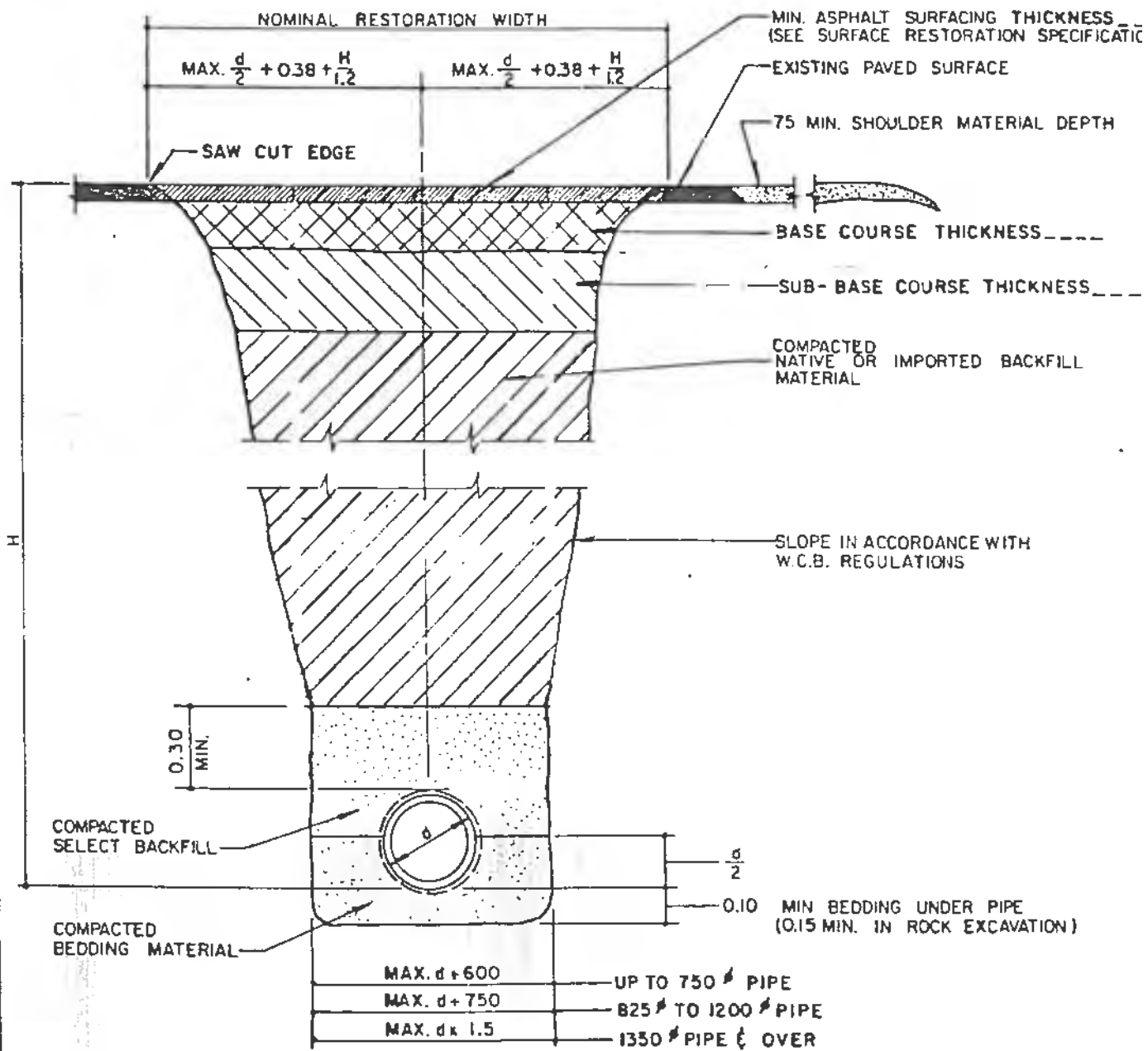


SKID LOCATION DETAIL



**VILLAGE OF PORT CLEMEN
ENCASEMENT PIPE DETAIL**

REV. N	DATE	DATE	APPROVED	DWG. No.
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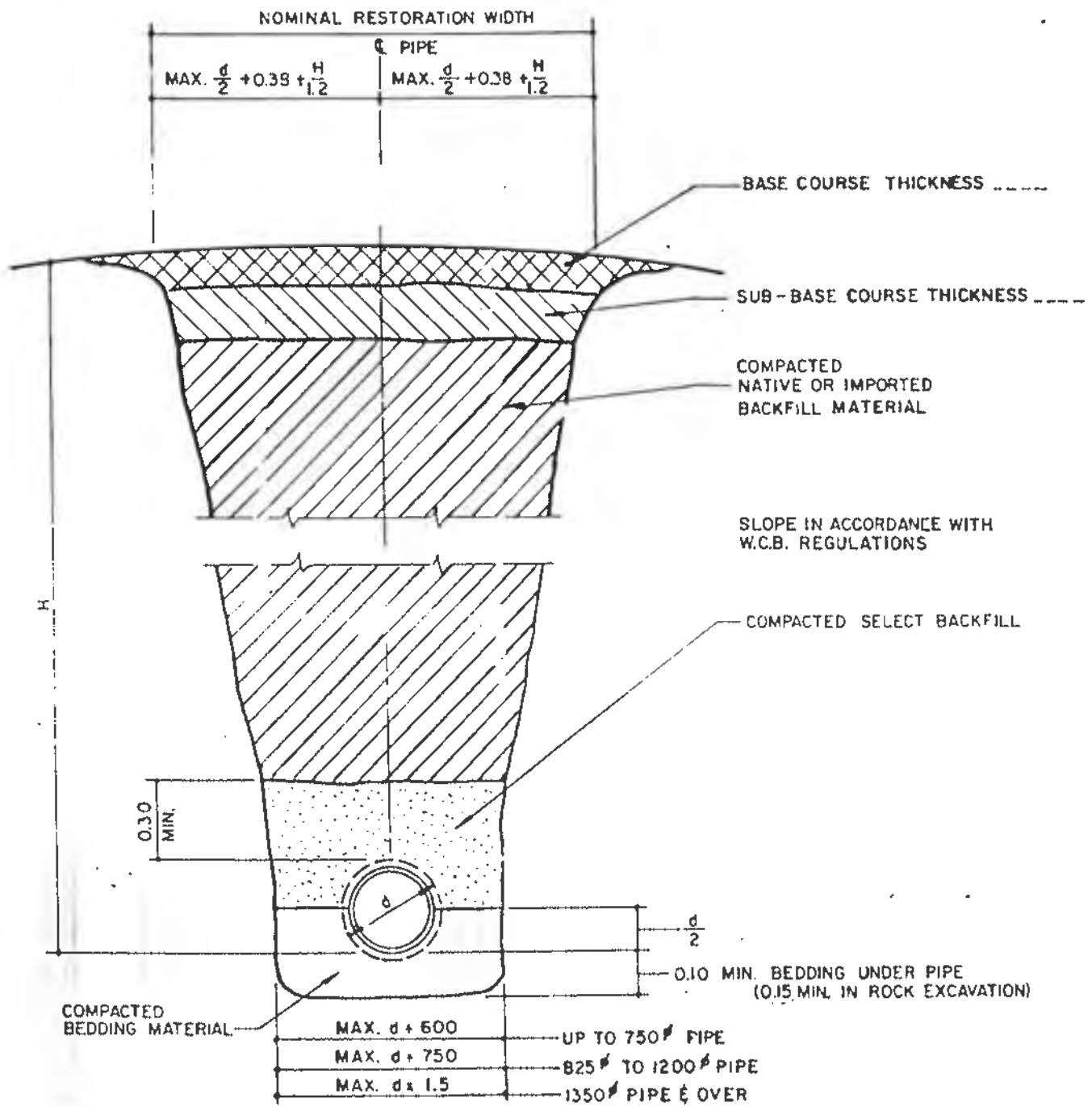


NOTE:
"d" = OUTSIDE DIAMETER OF THE PIPE



VILLAGE OF PORT CLEMENT
TRENCH DETAILS
IN PAVED AREAS

REV. N	DATE	DATE	APPROVED	DWG No.
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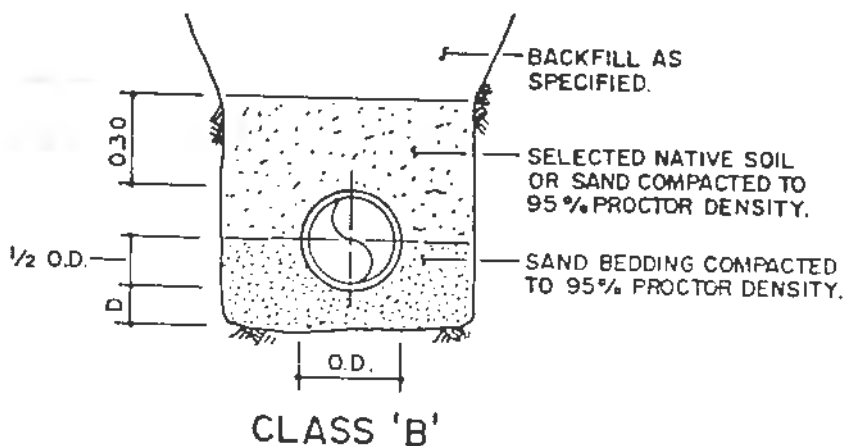
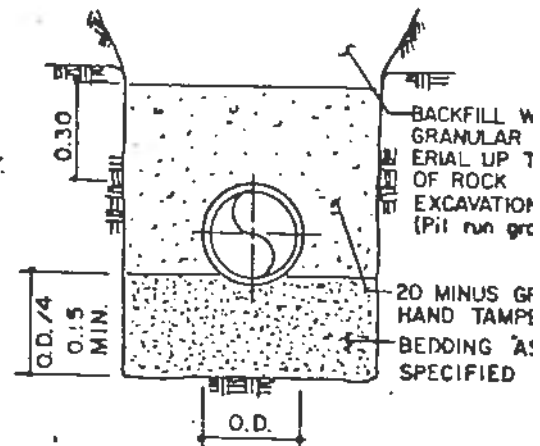
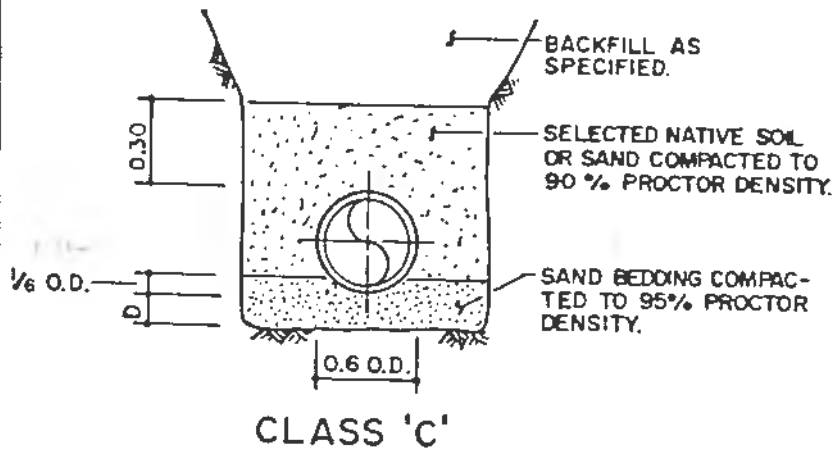


NOTE:
 d = OUTSIDE DIAMETER OF THE PIPE BELL
 AT ITS LARGEST SECTION



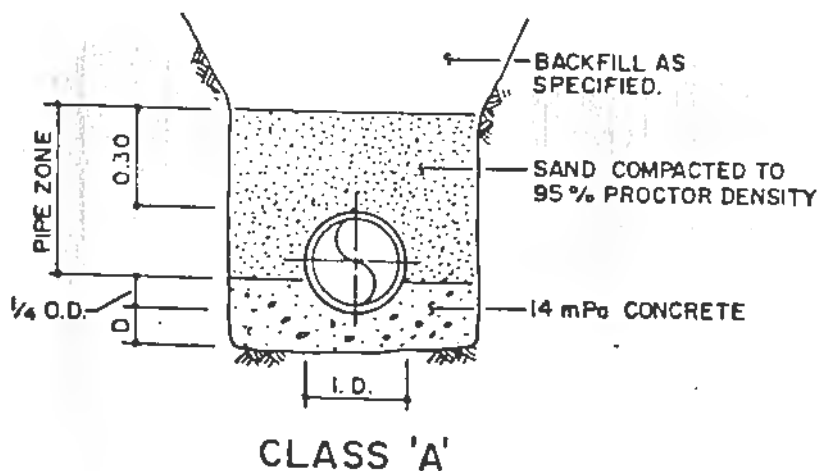
VILLAGE OF PORT CLEMEN
 TRENCH DETAILS
 IN GRAVELLED AREAS

REV,N	DATE	DATE	APPROVED	DWG No.
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ROCK TRENCH

PIPE SIZE	D (MIN.)
675 or smaller	75
750 to 1500	100
1650 and larger	150
PIPE SIZE	TRENCH WID
750 or smaller	O.D. + 600 M
925 to 1200	O.D. + 750 M
1350 and over	O.D. X 1.5 M



VILLAGE OF PORT CLEMEN

TRENCH BEDDING DETAILS

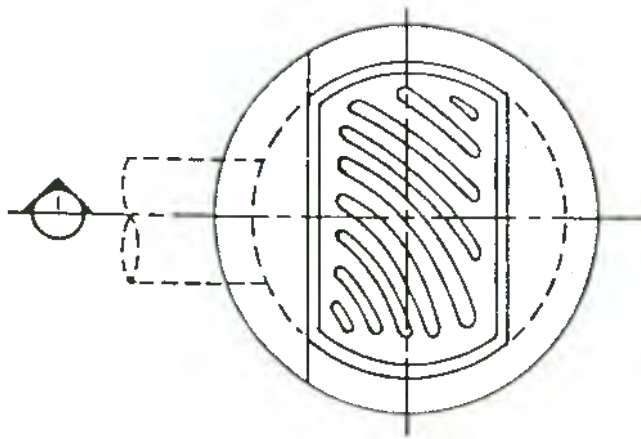
REV,N

DATE

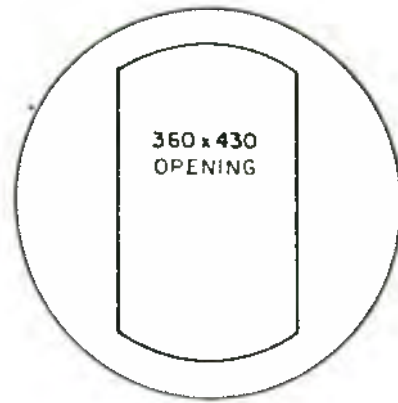
DATE

APPROVED

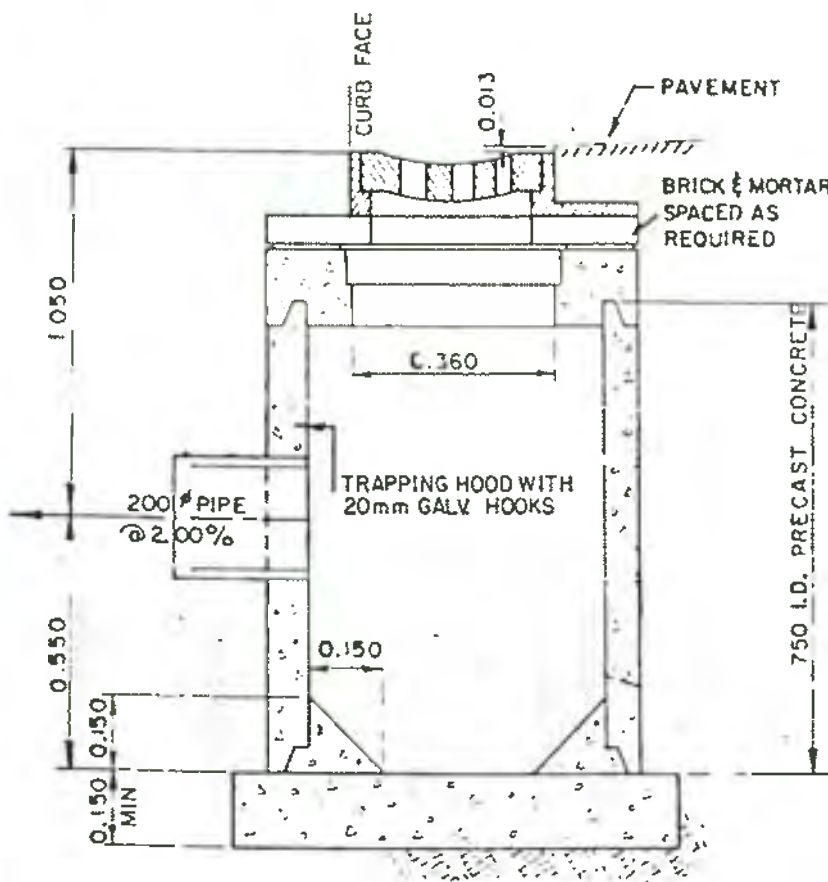
DWG. No.



PLAN



H20 LID



SECTION I

NOTES

- 1 GRATING - MAINLAND FOUNDRY TYPE 'D' 14 F
FRAME - MAINLAND FOUNDRY TYPE 'D' 14 F
- 2 MAX MIN 3, MINIMUM COURSE OF BRICK OR PRECAST CONCRETE RISER RING Laid IN PORTLAND CEMENT MORTAR
- 3 PRECAST CONCRETE LID REINFORCED TO H20 HIGHWAY LOADING
- 4 MORTAR SHALL COMPLY TO ASTM C-270 LATEST REVISION
- 5 PRECAST REINFORCED CONCRETE SECTIONS SHALL CONFORM TO ASTM C-476 LATEST REVISION
- 6 PRECAST REINFORCED RISER RINGS TO CONFORM TO ASTM C-478 LATEST REVISION

NOTE:

WHERE DISTANCE TO PROPOSED 'TIE-IN' MANHOLE EXCEEDS 10 METRES, THE STORM SEWER SHALL BE EXTENDED AND A NEW MANHOLE INSTALLED.



Stanley

STANLEY ASSOCIATES ENGINEERING LTD

VILLAGE OF PORT CLEMENTS

CATCH BASIN ASSEMBLY

REV/N

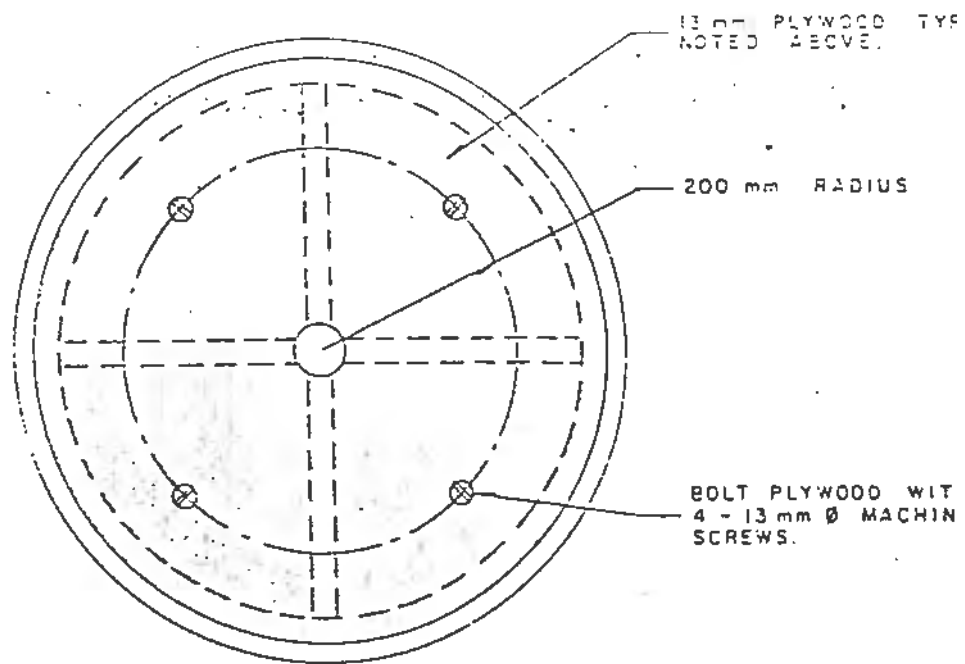
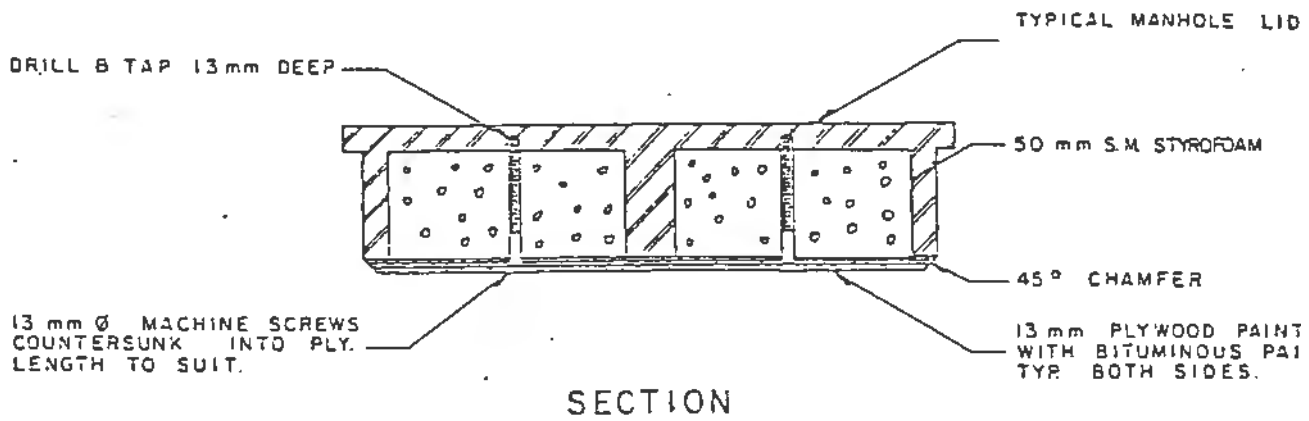
DATE

DATE


APPROVED

DWG N^o

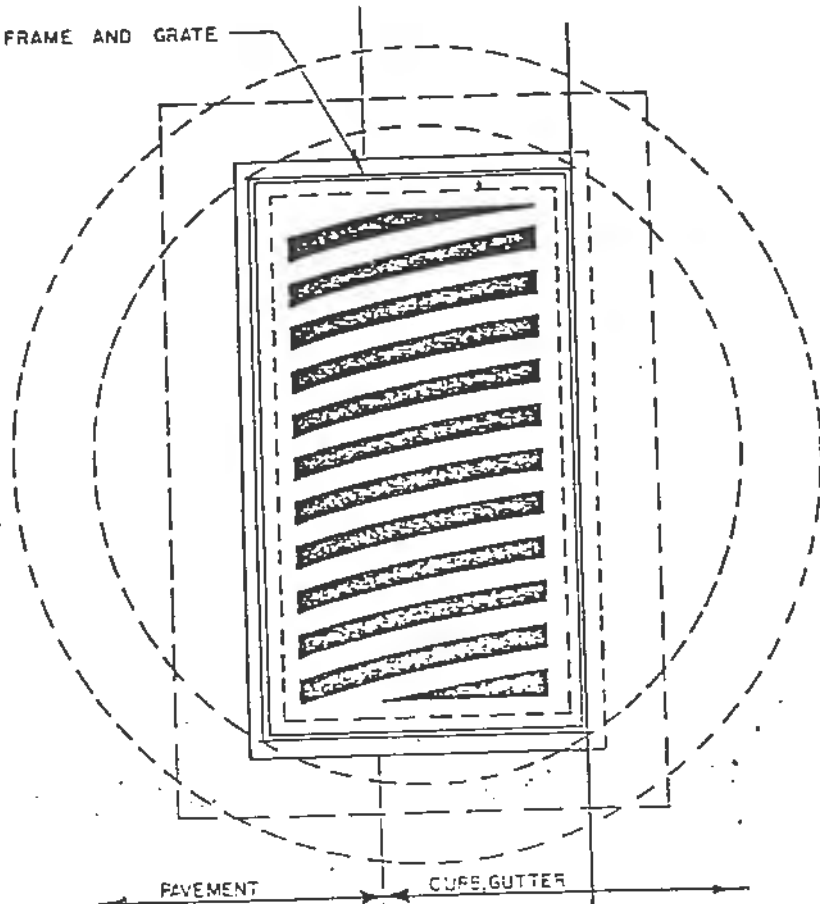
59



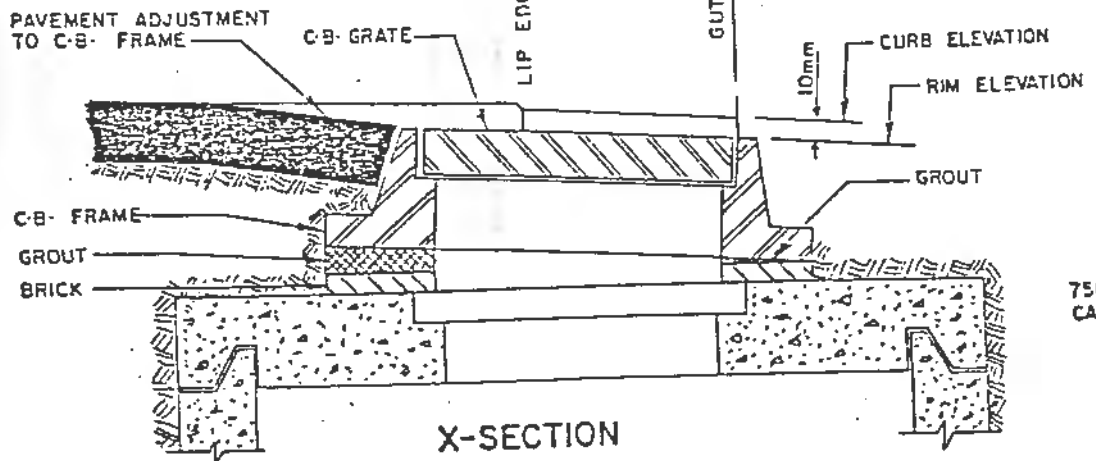
BOTTOM OF COVER

 Stanley STANLEY ASSOCIATES ENGINEERING LTD.			VILLAGE OF PORT CLEMENT		
			MANHOLE COVER INSULATION DETAIL		
	REV'N	DATE	DATE	APPROVED	DWG. NO.

CATCH BASIN FRAME AND GRATE
(SEE S9)



PLAN



X-SECTION



Stanley

STANLEY ASSOCIATES ENGINEERING LTD.

VILLAGE OF PORT CLEMENS

CATCH BASIN ADJUSTMENT

REV'N

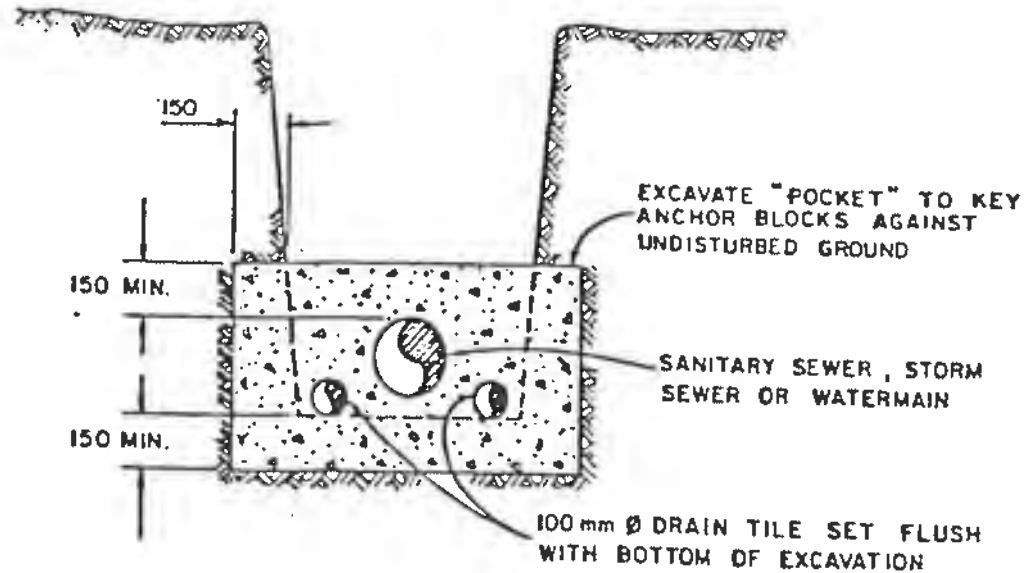
DATE

DATE

APPROVED

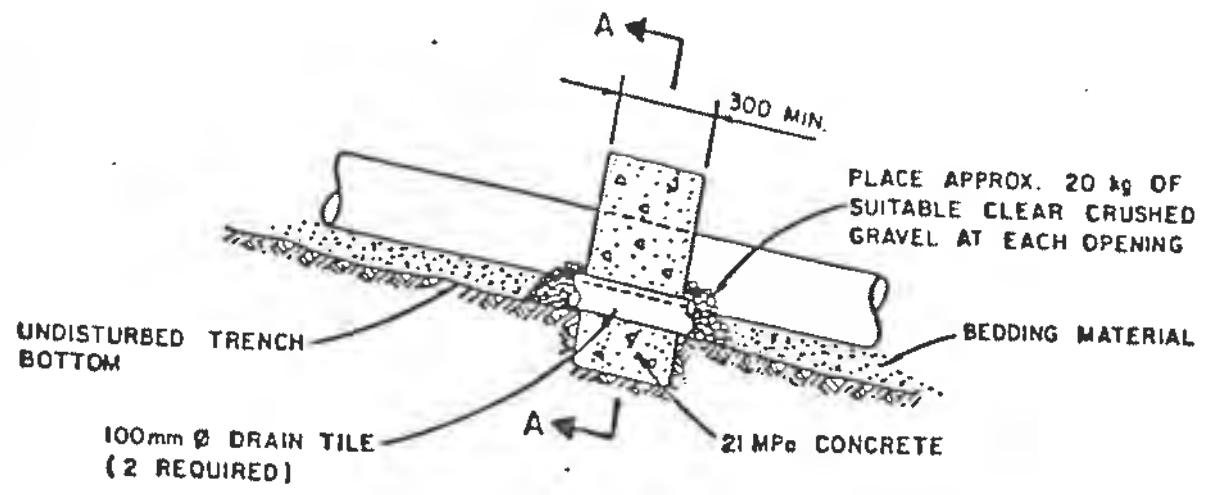
DWG. NO

S




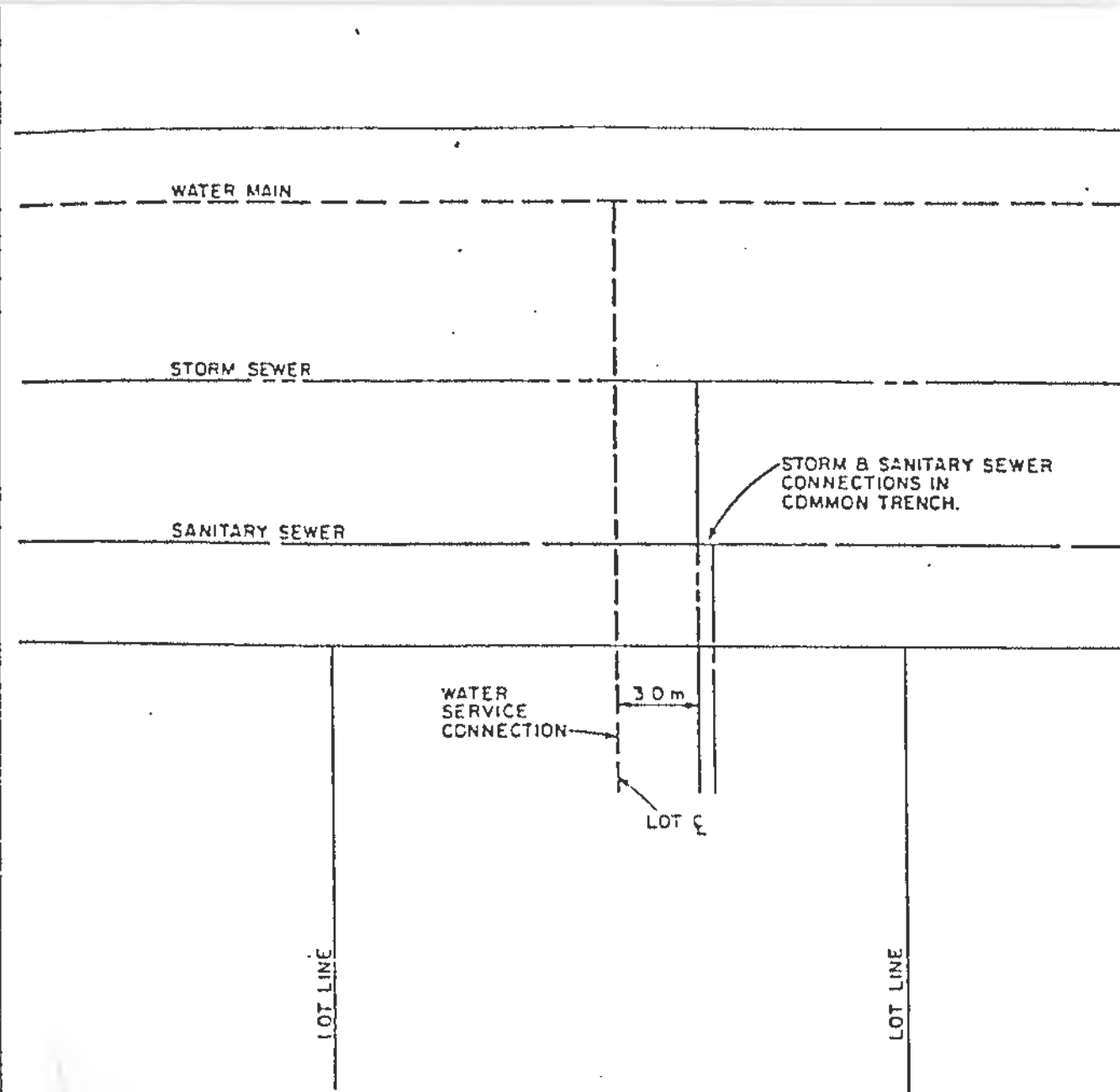
SECTION A-A

SPACING OF CONCRETE BLOCKS		
SANITARY & STORM SEWERS		WATERMAINS
SLOPE	MAX SPACING	
15 % UP TO 20 %	AS REQUIRED	ON GRADES 8% OR GREATER TWO BLOCKS PER PIPE LENGTH REQUIRED.
20 % - 35 %	9.0m	
35 % - 50 %	6.0m	
50 % - OVER	4.0m	




LONGITUDINAL SECTION

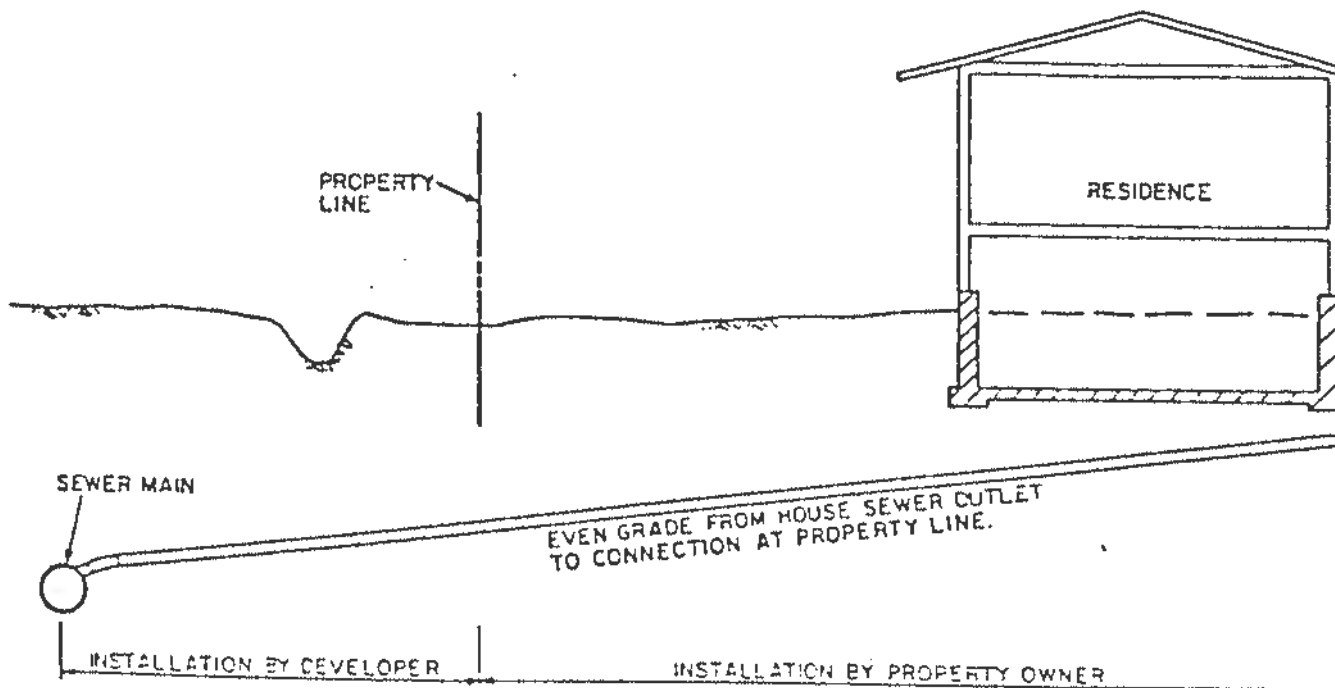
 Stanley STANLEY ASSOCIATES ENGINEERING LTD.		VILLAGE OF PORT CLEMENT		
		ANCHOR BLOCK		
REV'N	DATE	DATE	APPROVED	DWG. NO.



NOTE


SERVICE CONNECTIONS FOR DRAINAGE AND SEWER SHALL BE MEASURED FROM THE CENTRE OF THE LOT. FOR SLOPED LOTS THE SEWER CONNECTIONS SHALL BE LOCATED ON THE LOWEST SIDE OF CENTRE.

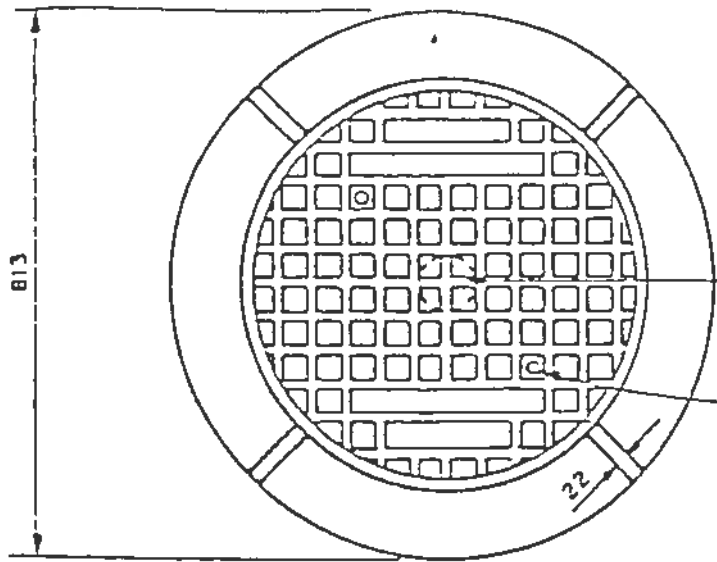
 Stanley STANLEY ASSOCIATES ENGINEERING LTD.			VILLAGE OF PORT CLEMEN	
			LOCATION OF SERVICE CONNECTIONS	
REV,N	DATE	DATE	APPROVED	DWG NO



NOTES:

1. THE SECTION FROM THE HOUSE SEWER CUTLET TO THE PROPERTY LINE INCLUDING THE CONNECTION TO THE EXIST. SERVICE LINE IS THE PROPERTY OWNER'S RESPONSIBILITY.
2. MIN. PIPE DIA. IS 100 mm.
3. MIN. PIPE COVER AT PROPERTY LINE IS 2.5 m.
4. SAND BEDDING REQUIRED FOR ALL TYPES OF PIPE FROM 100 mm BELOW THE PIPE TO THE SPRINGLINE.
5. RAINWATER AND FOUNDATION DRAINS ARE NOT TO BE CONNECTED TO THE SANITARY SEWER.
6. MIN. GRADE FOR 100 mm DIA. PIPE IS 2.0% OR 20 mm/m.
7. ANY CHANGE IN DIRECTION TO BE MADE WITH WYES OR 1/8 BENDS.

 Stanley STANLEY ASSOCIATES ENGINEERING LTD.			VILLAGE OF PORT CLEMEN		
			TYPICAL RESIDENTIAL SEWER CONNECTION		
REV, N	DATE	DATE	APPROVED	DWG No	

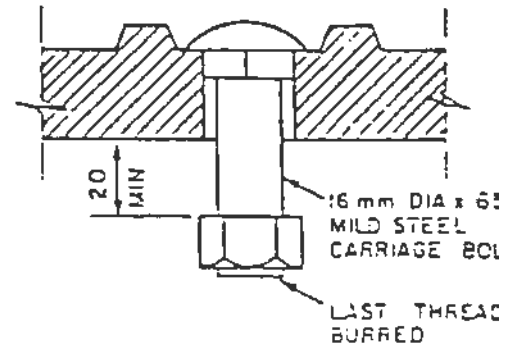


NOTE:
 LETTERING SHALL BE 25 mm FLATTENED
 FACE GOTHIC LETTERING WITH FACE OF
 LETTERS RAISED TO THE SAME LEVEL
 AS THE TOP OF THE RIBS

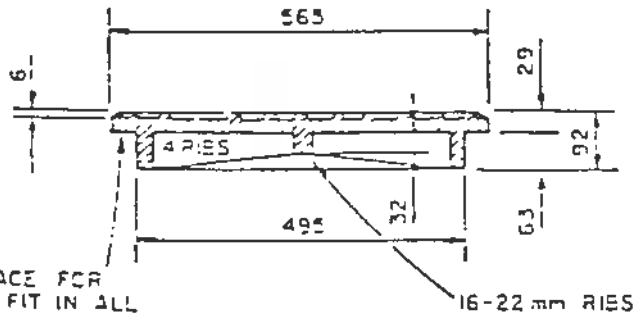
MANUFACTURERS SYMBOL 90 mm MAX
 DIMENSION, CIRCLE OR SQUARE

22 mm DIA. HOLE FOR CARRIAGE BOLT
 TWO REQ'D AS SHOWN

PLAN

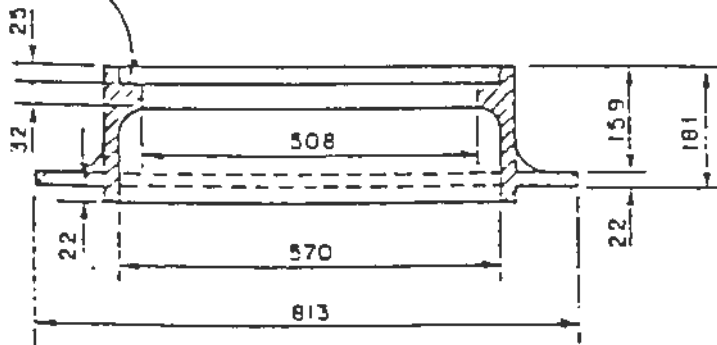


CARRIAGE BOLT DETAIL



COVER

MACHINE SURFACE FOR
 NON ROCKING FIT IN ALL
 POSITIONS. ALLOW 2 mm
 RAISED FACE IN CASTING
 FOR MACHINING



FRAME

APPROXIMATE WEIGHTS

COVER - 60-66 kg

FRAME - 102-108 kg

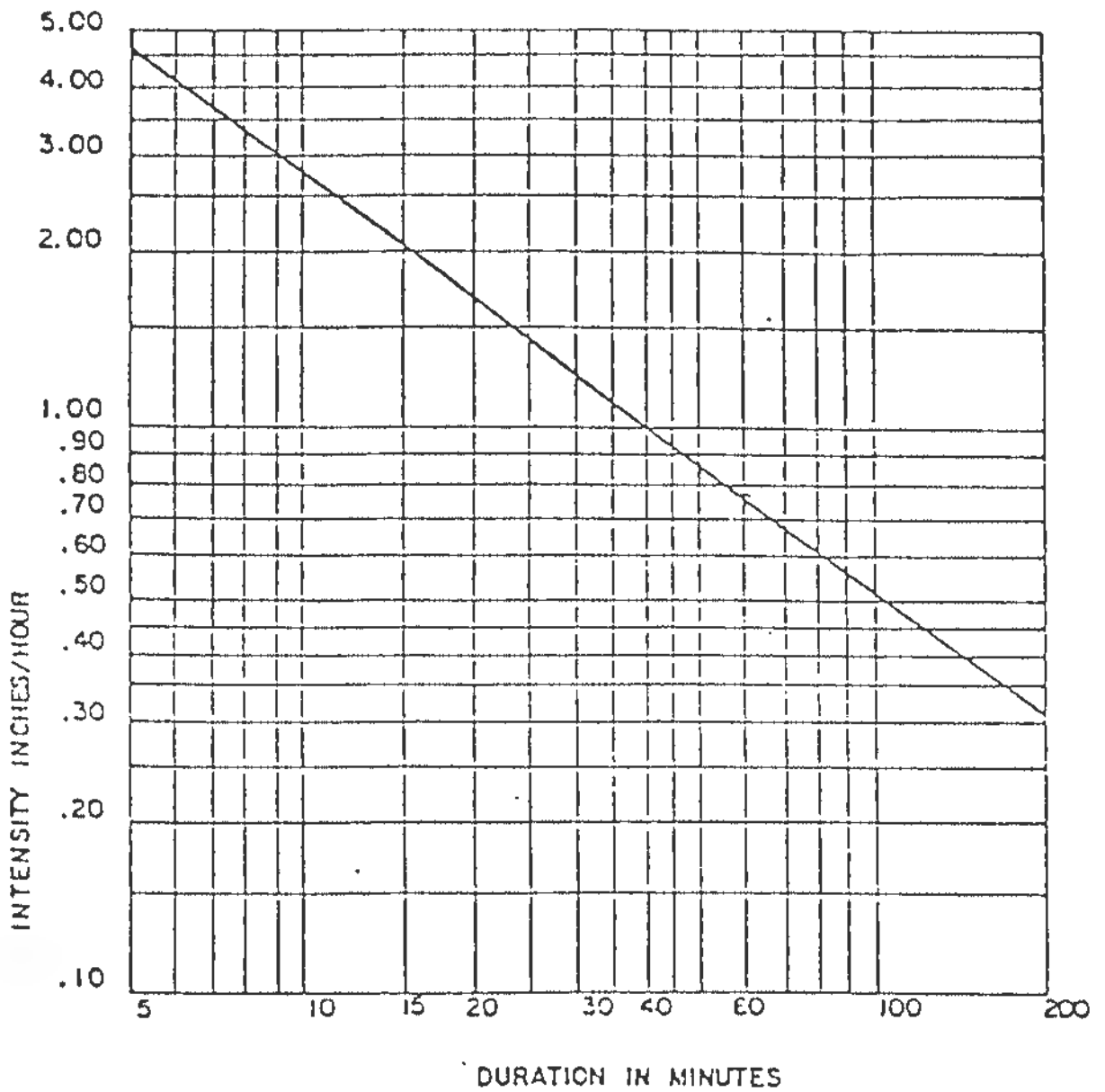
NOTE:
 ALL DIMENSIONS ARE
 IN millimetres UNLESS
 OTHERWISE INDICATED




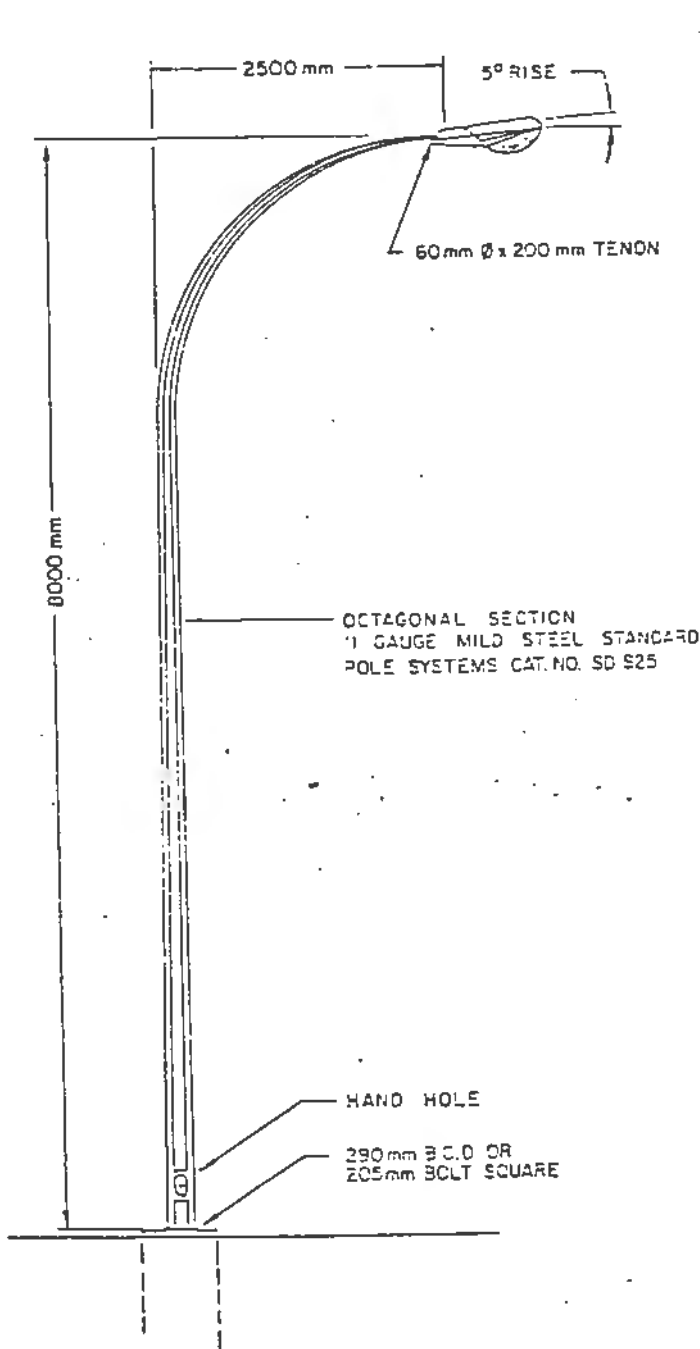
VILLAGE OF PORT CLEMEN

MANHOLE COVER B FRAME

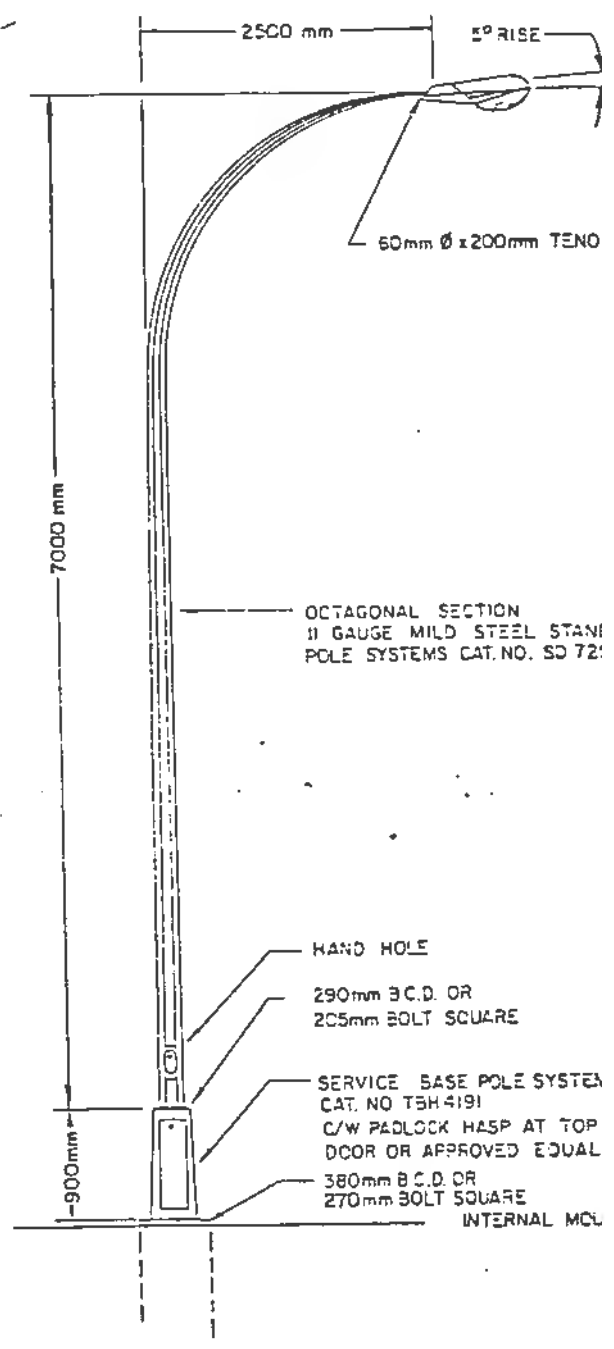
REV. N	DATE	DATE	APPROVED	DWG No
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		VILLAGE OF PORT CLEMEN			
		RAIN FALL INTENSITY DURATION CURVE			
	REV. N	DATE	DATE	APPROVED	DWG. N




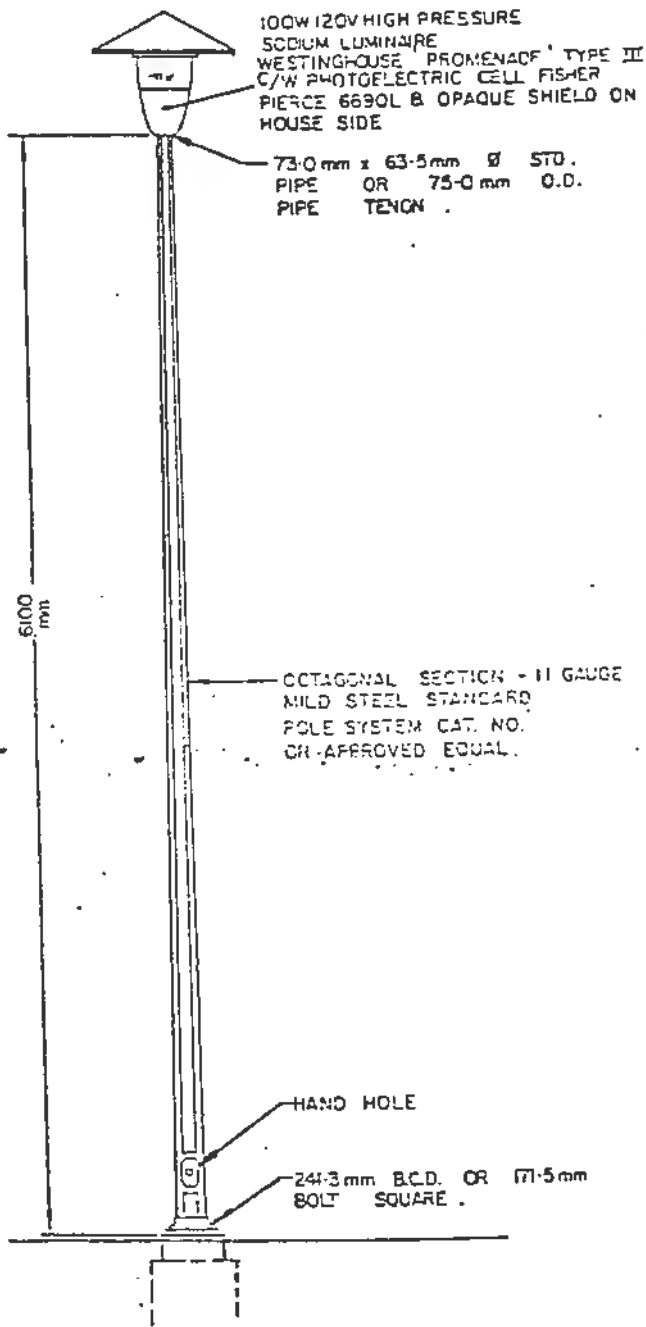
TYPE A



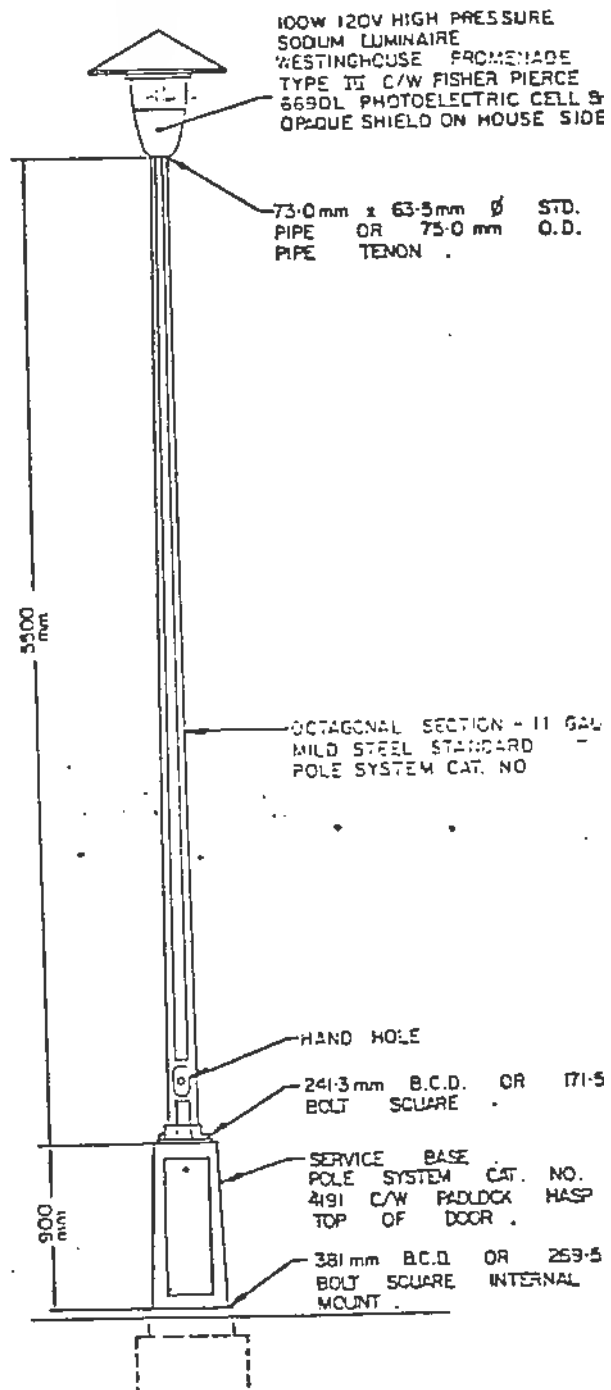
TYPE B

1. POLES AND SERVICE BASES TO BE GALV WITH ZINC CHROMATE PRIMER AT FACTORY AND PAINTED AFTER ERECTION WITH ONE COAT OF GREEN TREM CLAD.
2. BASE BOLT COVERS TO BE USED ON TYPE 'B' POLES ONLY.

 Stanley STANLEY ASSOCIATES ENGINEERING LTD			VILLAGE OF PORT CLEMEN	
			DAVIT STREET LIGHTS	
REV'N	DATE	DATE	APPROVED	DWG. NO.



TYPE C



TYPE D

NOTE:

1. POLES AND SERVICE BASES TO BE ZINC CHROMATE PRIMED AT FACTORY AND PAINTED AFTER ERECTION WITH ONE COAT OF GREEN TREM CLAD.
2. INSTALLATION OF POST-TOP STREET LIGHTING REQUIRES APPROVAL IN ADVANCE FROM THE VILLAGE



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STANLEY ASSOCIATES ENGINEERING LTD.

VILLAGE OF PORT CLEMENT

POST TOP STREET LIGHTS

REV N

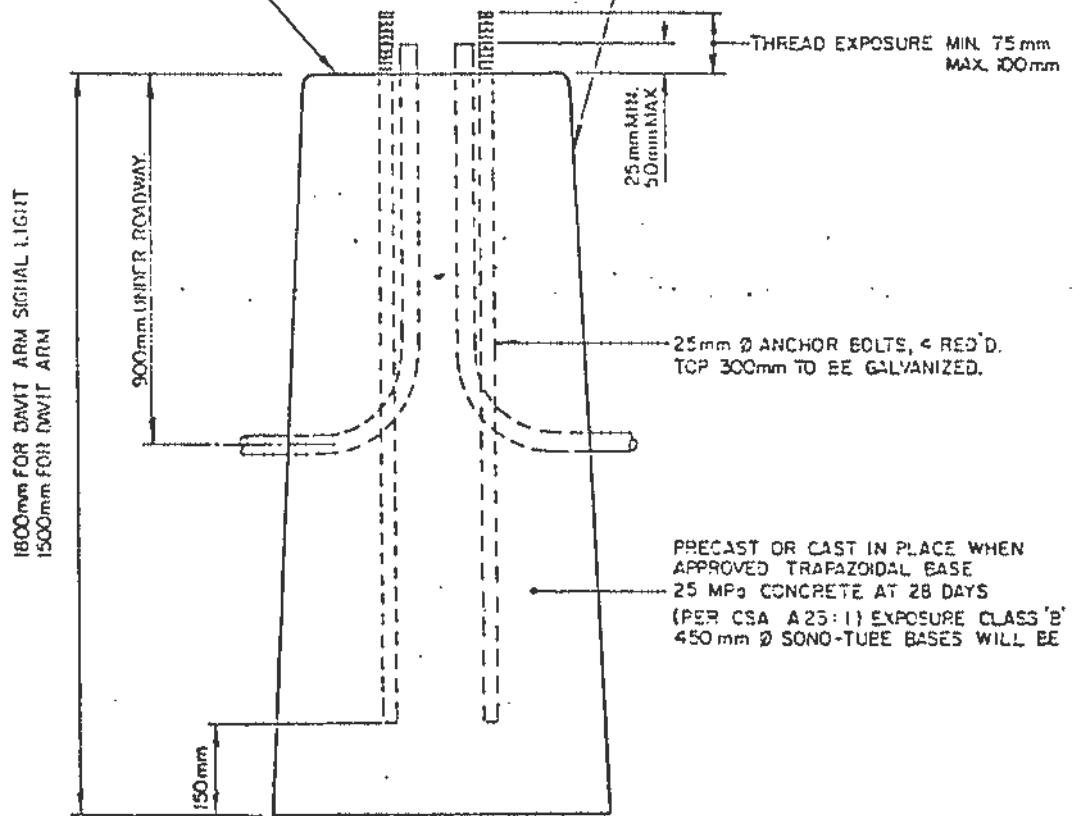
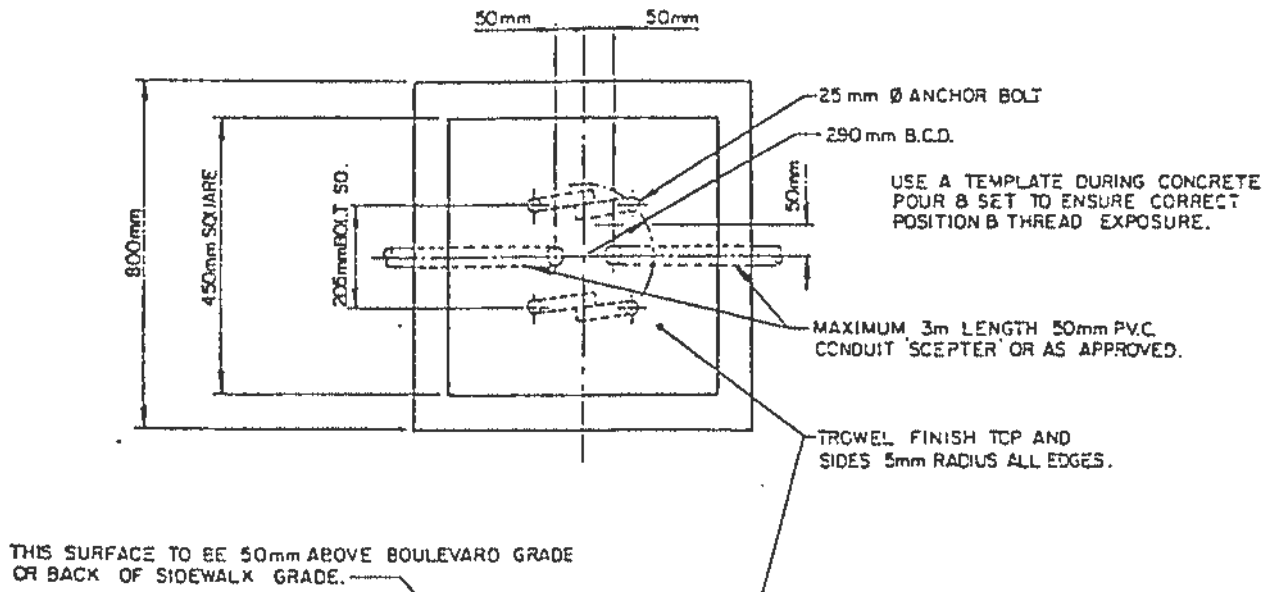
DATE

DATE

APPROVED

DWG. NO.

E



NOTE:
STRUCTURAL (CIVIL) ENGINEER SHALL MODIFY BASE REQUIREMENTS TO COMPENSATE FOR SITE SOIL CONDITIONS.



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STANLEY ASSOCIATES ENGINEERING LTD

VILLAGE OF PORT CLEMENT

STREET LIGHT ANCHOR BASE FOR TYPE A & C POLES

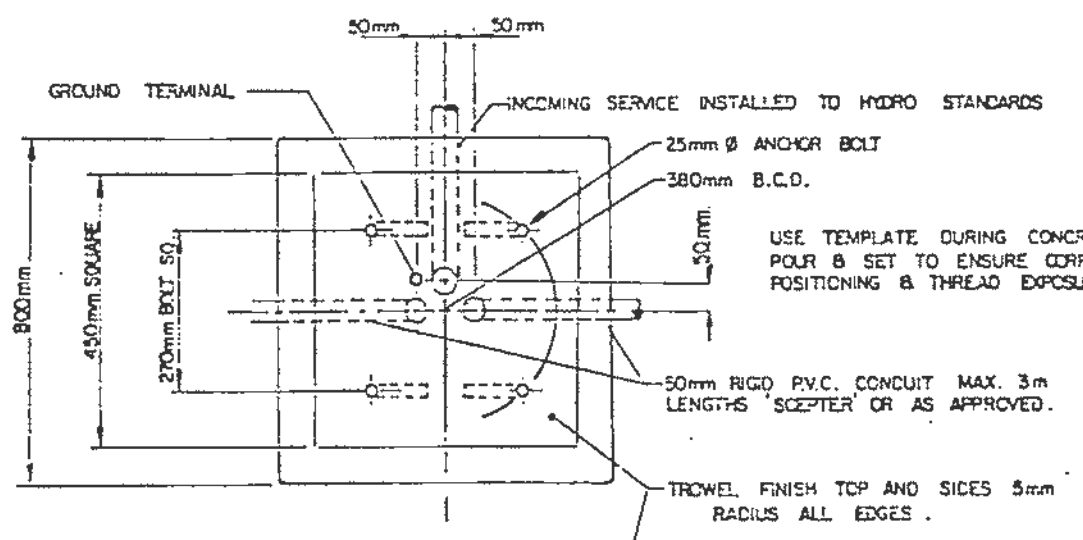
REV'N

DATE

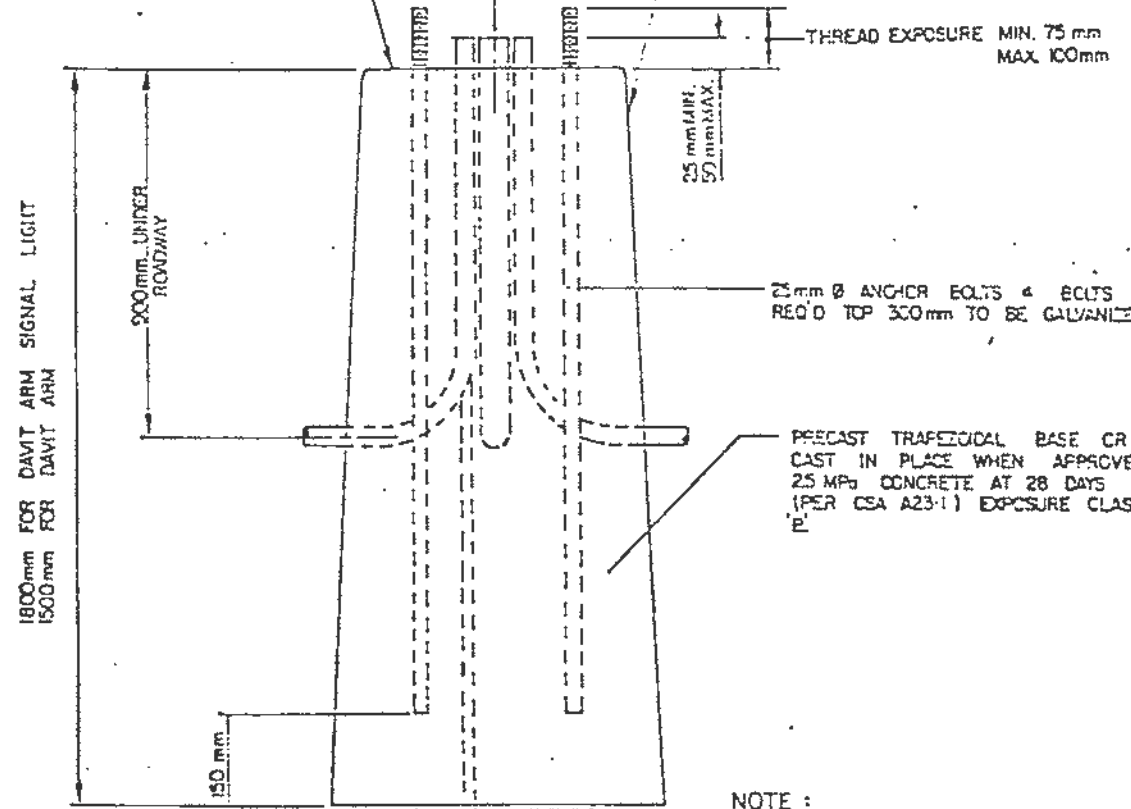
DATE

APPROVED

DWG. NO. E2



THIS SURFACE TO BE 50mm ABOVE BOULEVARD GRADE OR BACK OF SIDEWALK GRADE.



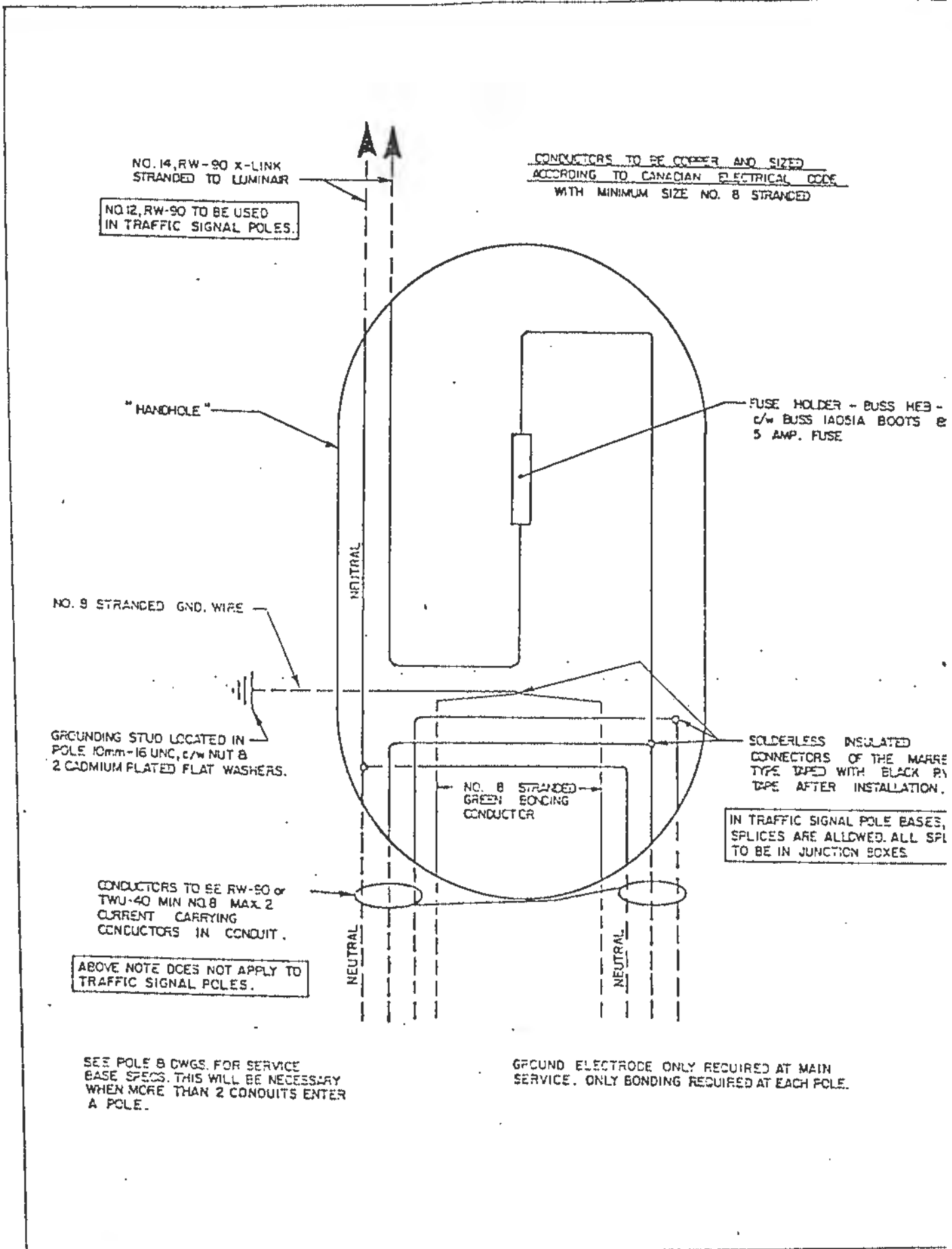
16# STRANDED GROUND WIRE TO A COPPERWELD PLATE ELECTRODE HAVING NOT LESS THAN 0.2 m² OF SURFACE AREA AND SHALL BE NOT LESS THAN 1.5mm IN THICKNESS.


NOTE :
STRUCTURAL (CIVIL) ENGINEER SHALL MODIFY BASE REQMTS TO COMPENSATE FOR SITE SOIL CONDITIONS.



VILLAGE OF PORT CLEMEN
STREET LIGHT ANCHOR BASE
FOR TYPE B & D POLES

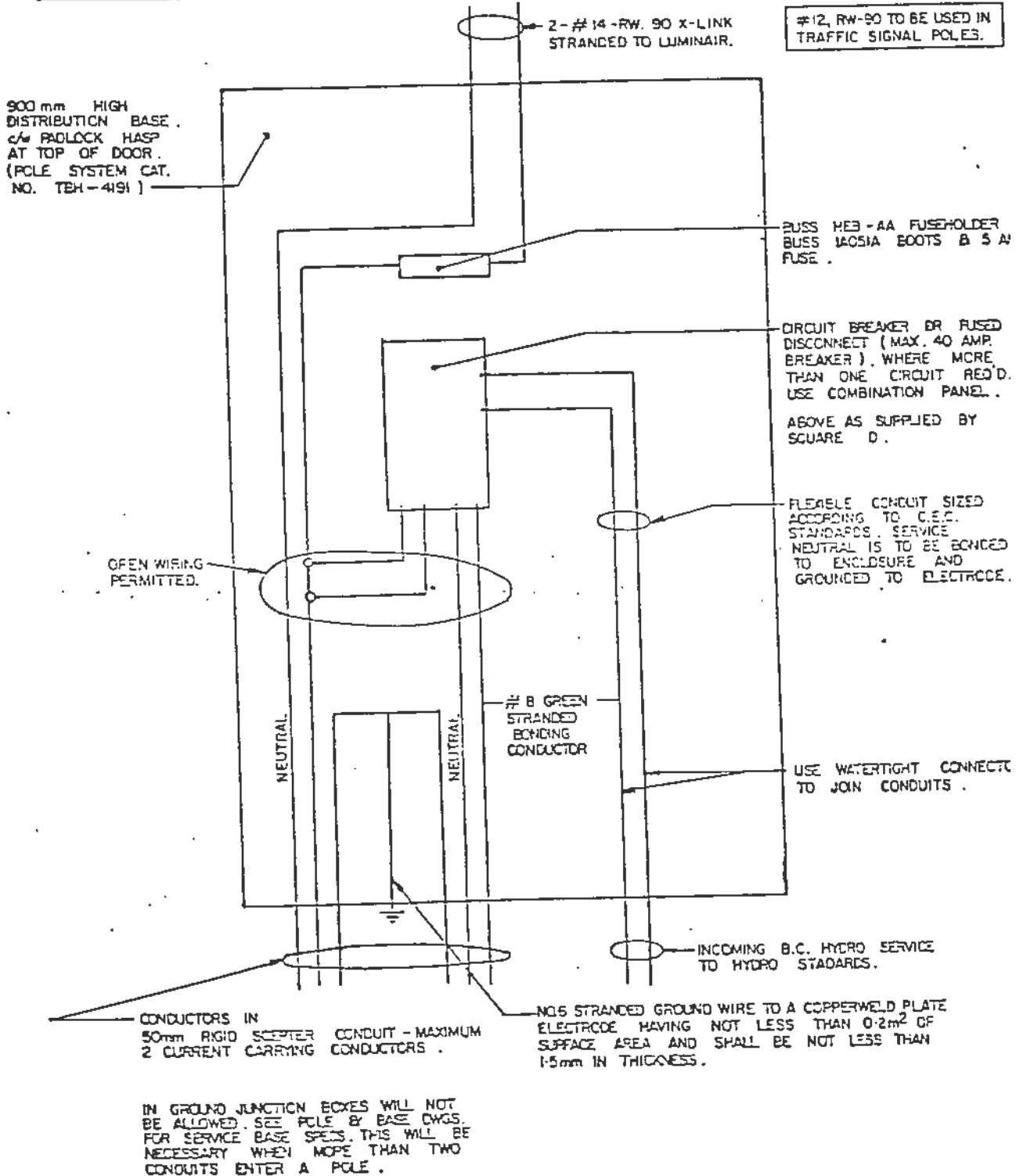
REV'N	DATE	DATE	APPROVED	DWG. NO
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 Stanley STANLEY ASSOCIATES ENGINEERING LTD	REV'N	DATE	VILLAGE OF PORT CLEMENT		
			HANDHOLE WIRING SCHEMATIC 120 V. STREET LIGHT		
			DATE	APPROVED	DWG. NO

CONDUCTORS TO BE COPPER AND SIZED ACCORDING TO CANADIAN ELECTRICAL CODE. MINIMUM #8

CONDUCTORS BETWEEN POLES TO BE RW 90



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STANLEY ASSOCIATES ENGINEERING LTD

VILLAGE OF PORT CLEMENT

SERVICE BASE SCHEMATIC
120V. STREET LIGHT

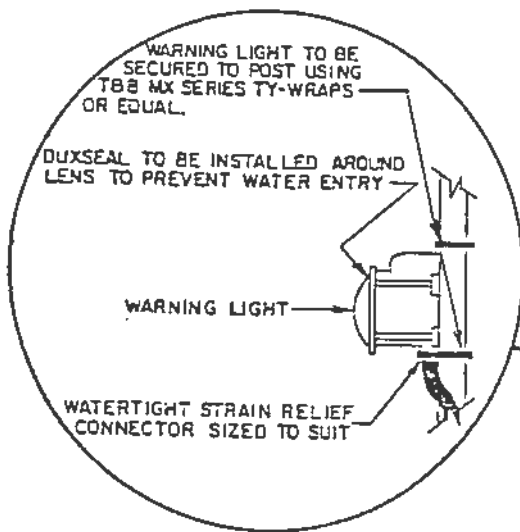
REV.N

DATE

DATE

APPROVED

DWG.NO



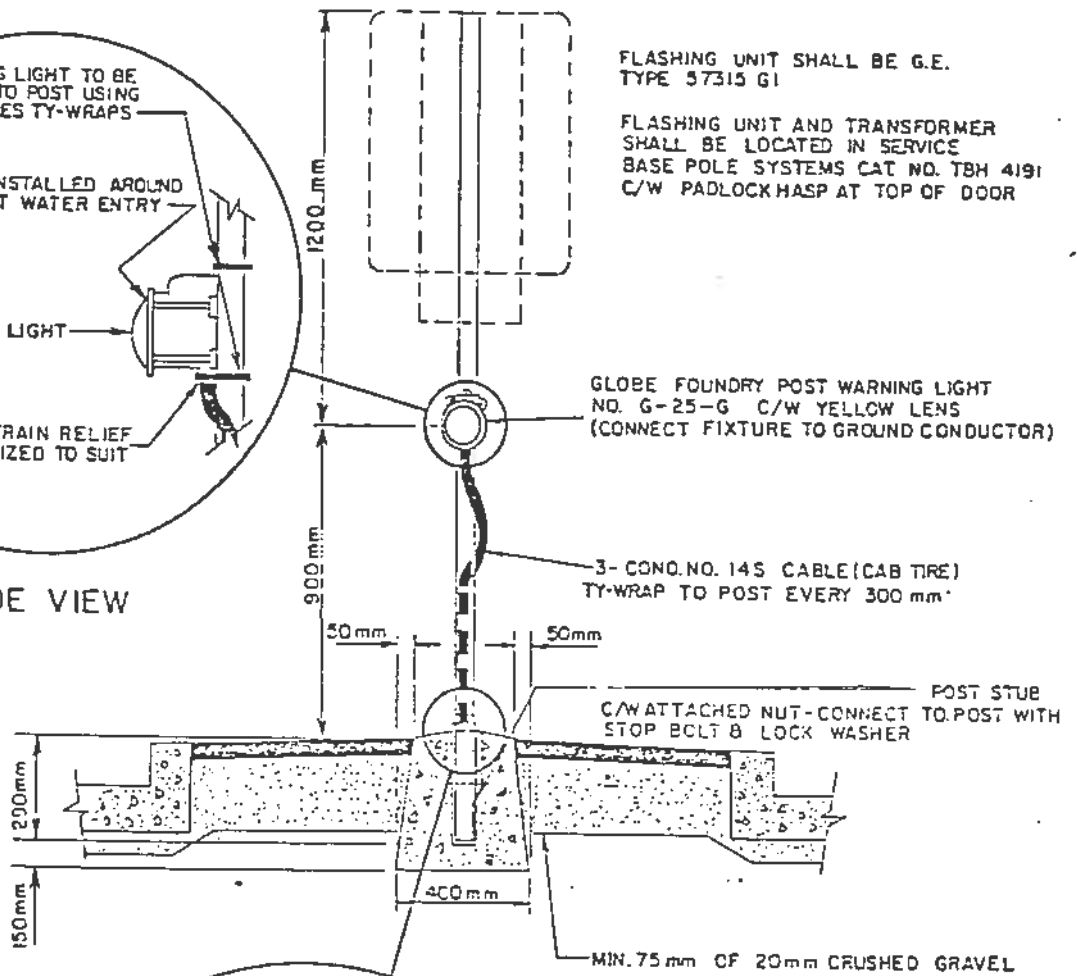
SIDE VIEW

FLASHING UNIT SHALL BE G.E. TYPE 57315 G1

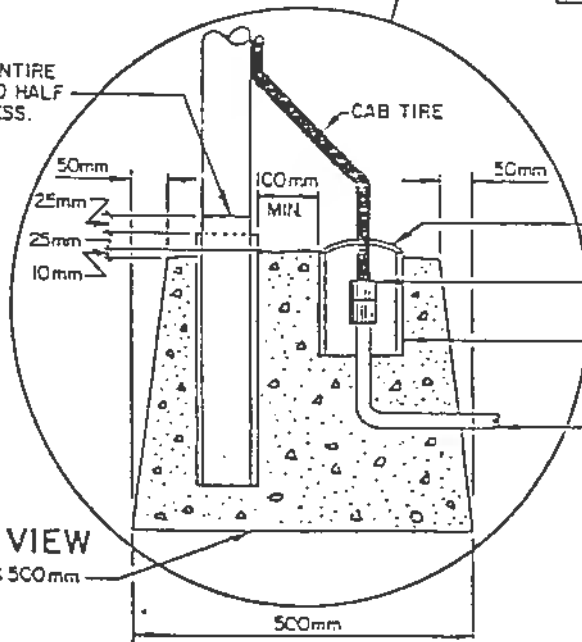
FLASHING UNIT AND TRANSFORMER SHALL BE LOCATED IN SERVICE BASE POLE SYSTEMS CAT NO. TBH 4191 C/W PADLOCK HASP AT TOP OF DOOR

GLOBE FOUNDRY POST WARNING LIGHT NO. G-25-G C/W YELLOW LENS (CONNECT FIXTURE TO GROUND CONDUCTOR)

3- COND. NO. 14S CABLE (CAB TIRE) TY-WRAP TO POST EVERY 300 mm



SCORE POST FOR ENTIRE CIRCUMFERENCE TO HALF OF WALL THICKNESS.



SIDE VIEW

BASE 400mm X 500mm

PVC OR POLY CAP
20mm COUPLING & STRAIN RELIEF CONNECTOR RECESSED IN PIPE.

100mm LD. PVC. PIPE X 150mm LONG

CABLE IN 20mm RIGID STEEL CONDUIT. P.V.C. NOT ALLOWED TO J.E.

NOTE:

MEDIAN WARNING LIGHT TO BE INSTALLED 2m FR END OF ISLAND. JUNCTION BOX TO BE LOCATED WITHIN 2m CF WARNING LIGHT.



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VILLAGE OF PORT CLEMENT

MEDIAN WARNING LIGHT MOUNTING DETAIL

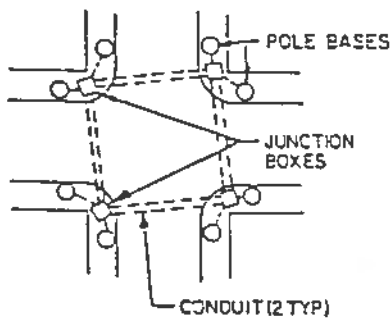
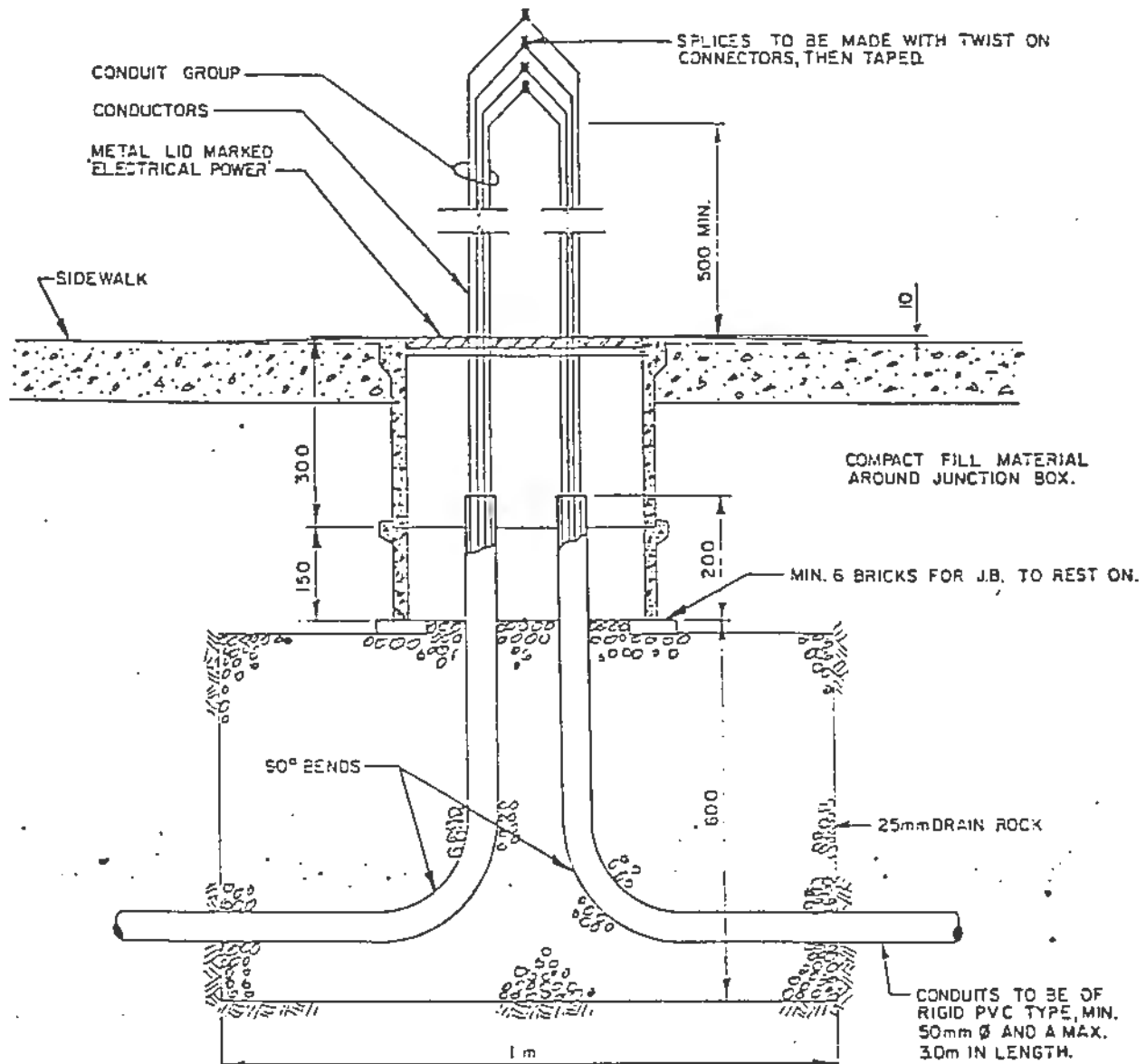
REV/N

DATE

DATE

APPROVED

DWG. NO.



NOTE:

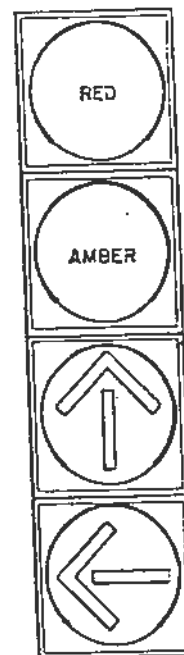
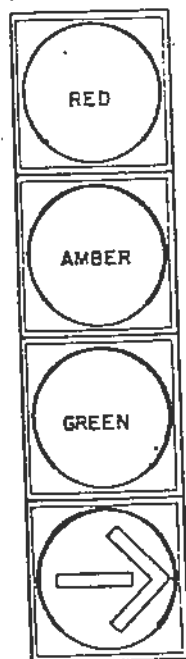
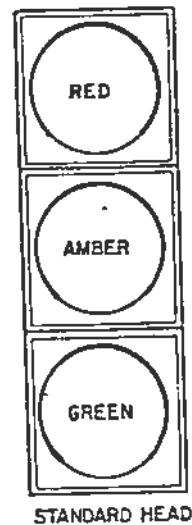
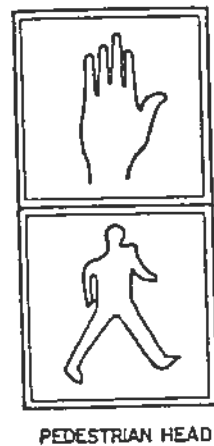
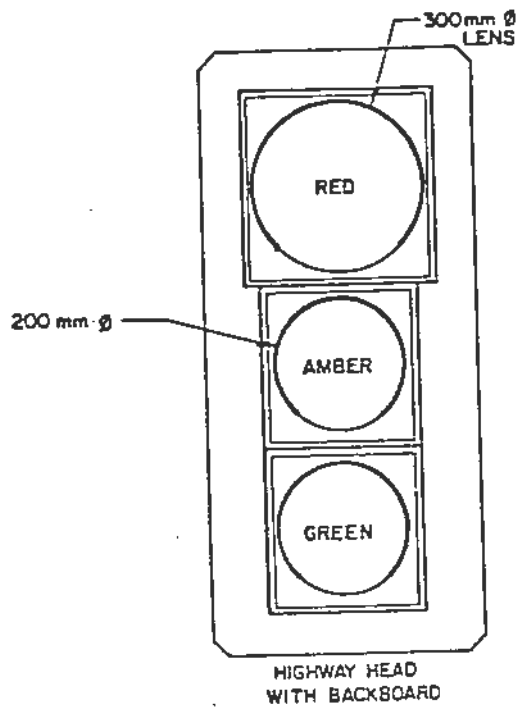
1. JUNCTION BOXES SHALL BE 760mm BY 300mm AS PER A.E. CONCRETE PRECAST PRODUCTS.
2. CONDUCTORS TO BE PULLED THROUGH POLE BASES AND SPLICED ONLY IN JUNCTION BOXES.
3. CONDUITS TO BE IDENTIFIED AT EACH END.
4. CONDUCTORS TO BE IDENTIFIED BY WIRE MARKERS AS WELL AS CONDUCTOR COLOUR.
5. CONDUCTORS FOR TRAFFIC SIGNALS TO BE #14AWG RW90 X-LINK STRANDED COPPER.
6. CONDUCTORS FOR STREET LIGHTS TO BE MIN.#8AWG RW90 X-LINK STRANDED COPPER.




VILLAGE OF PORT CLEMEN

JUNCTION BOX FOR TRAFFIC SIGNALS

REV'N	DATE	DATE	APPROVED	DWG.NO



SPECIAL HEADS
CORRECT DISPLAY SEQUENCES FOR VARIOUS SIGNAL HEADS

 Stanley STANLEY ASSOCIATES ENGINEERING LTD		VILLAGE OF PORT CLEMENT		
		SIGNAL HEAD PATTERNS		
REV'N	DATE	DATE	APPROVED	DWG. NO.