



BYLAW NO. 1800

SUBDIVISION SERVICING & DEVELOPMENT STANDARDS

A bylaw to establish subdivision servicing and development standards

WHEREAS Section 506 of the *Local Government Act* authorizes a local government to enact a bylaw to regulate and require the provision of works and services in respect to the subdivision of land;

AND WHEREAS Section 506 of the *Local Government Act* authorizes a local government to enact a bylaw as a condition of:

- (a) the approval of a subdivision, or
- (b) the issue of a building permit,

A local government may require that the owner of the land provide works and services, in accordance with the standards established in a bylaw under this section, on that portion of a highway immediately adjacent to the site being subdivided or developed, up to the centre line of the highway;

NOW THEREFORE the Council of the Town of Smithers in open meeting assembled, enacted as follows:

1.0 ADMINISTRATIVE PROVISIONS

- 1.1 This bylaw may be cited as the "Bylaw No. 1800 - Subdivision Servicing & Development Standards" and takes effect as of the date of adoption.
- 1.2 If any portion of this bylaw is found invalid by a court of competent jurisdiction, it shall be severed and the severance shall not affect the validity of the remainder of the bylaw.
- 1.3 "Bylaw No. 1723 – Subdivision Servicing & Development Standards" and all amendments are hereby repealed.

2.0 DEFINITIONS:

- 2.1 In this bylaw, unless the context otherwise requires:

APPROVAL means written approval of a subdivision by the Approving Officer or issuance of building permit by the Building Inspector.

APPROVING OFFICER means a person authorized by the Town of Smithers Council to act as Approving Officer pursuant to the provisions of the *Land Title Act*.

BUILDING INSPECTOR means the Building Inspector for the Town of Smithers or designate.

COMMUNITY DRAINAGE SYSTEM means a system of works owned, operated and maintained by the Municipality, designed and constructed to control the collection, conveyance and disposal of surface and other water.

COMMUNITY SANITARY SEWER SYSTEM means a system owned, operated and maintained by the Municipality for the collection and disposal of sanitary sewage.

COMMUNITY WATER SYSTEM means a system of waterworks that is owned, operated and maintained by the Municipality.

DEVELOPMENT means an activity that requires a Building Permit.

HEALTH OFFICER means the official appointed under the *Public Health Act*.

HIGHWAY means and includes any street, road, lane, walkway, bridge, viaduct and any other way open to public use, but does not include a private right-of-way on private property.

MUNICIPALITY means the Town of Smithers.

OWNER means a person registered with the Land Title and Survey Authority of BC as owner of land or a charge on land whether entitled to it in his own right or in a representative capacity or otherwise, and includes "registered owner".

PARCEL means any lot, block or other area in which land is held or into which land is subdivided, but does not include a highway or portion thereof.

POTABLE WATER means water, which is accepted for drinking purposes by the Health Officer.

PROFESSIONAL ENGINEER means a person who is registered or duly licensed as such, under the provisions of the *Engineer & Geoscientists Profession Act* of the Province of British Columbia.

SUBDIVISION means the division of land into 2 or more parcels, whether by plan, apt descriptive words, or otherwise.

WALKWAY means a narrow highway for the predominant use of pedestrian traffic.

WORKS AND SERVICES means any public service, facility or utility which is required or regulated by this Bylaw and without restricting the generality of the foregoing includes: the supply and distribution of water; collection and disposal of sanitary sewage and drainage water; street lighting; access roadways, curbs, gutter, and sidewalks; and natural gas, power, telephone and cablevision services.

ZONE means a zone as provided for in the Zoning Bylaw of the Town of Smithers, and amendments thereto.

All words or expressions used in the bylaw shall have the same meaning assigned to them as words or expressions contained in the *Land Title Act* and the *Local Government Act*.

3.0 GENERAL PROVISIONS

3.1 The standards specified in this bylaw apply to all land within the boundaries of the Town of Smithers prior to final subdivision approval, as approved by the Approving Officer, or building permit issuance, as issued by the Building Inspector.

3.2 Administration

This bylaw shall be administered by:

- a) The Approving Officer of the Town of Smithers where works and services are to be provided because of subdivision of land; or

- b) The Building Inspector of the Town of Smithers where works and services are to be provided because of an application for a building permit; or
- c) An Officer appointed by Council.

3.3 Compliance with Other Regulations

Applications will be reviewed for compliance with the requirements of this bylaw and other Municipal and Provincial legislation. Nothing contained in this bylaw shall relieve the owner from the responsibility to seek out and comply with all applicable legislation. If any portion of this bylaw is held to be inconsistent with the *Local Government Act*, *Land Title Act*, or any other Provincial Statutes, the applicable Provincial Statute shall apply.

3.4 Exemptions

Notwithstanding Section 3.1, the provisions of this bylaw shall not apply:

- a) Where the proposed parcel is to be created solely for the use of unattended equipment necessary for the operation of:
 - i. a community water system;
 - ii. a community sewer system;
 - iii. a community gas distribution system;
 - iv. a community radio or television receiving antenna;
 - v. a radio or television broadcasting antenna;
 - vi. a telecommunication relay station;
 - vii. an automatic telephone exchange;
 - viii. an air or marine navigational aid;
 - ix. electrical substations or generating stations, or
 - x. any other similar public service or quasi-public service facility or utility.
- b) Where a proposed subdivision does not create any additional parcels and only results in highway or park dedication or an adjustment of boundaries between existing parcels.
- c) In the case of building permit issuance where:
 - i. The application of a building permit relates solely to work on a residentially zoned property with fewer than three residential dwelling units on an existing serviced parcel; or

- ii. The estimated total value of proposed construction is less than \$100,000 on an existing serviced parcel. Only one of these exemptions will be granted to one property in a two-year period.

3.5 Records

The Approving Officer shall maintain a record of all applications submitted under this bylaw with respect to subdivisions, which record shall indicate that final disposition of all such applications thereon.

The Building Inspector shall maintain a record of all occasions when the provisions of this Bylaw are used to require the provision of works and services in accordance with the standards of this bylaw and this record will show what works and services were provided and where.

3.6 Authorization for Entry

Employees of the Municipality are hereby authorized to enter at all reasonable times upon such property or premises to inspect the same in connection with their duties under this bylaw and to ascertain whether the provisions of this bylaw are being complied with.

3.7 Measurements

All measurements in this bylaw are expressed in metric units.

4.0 REQUIRED WORKS & SERVICES

4.1 Level of Works & Services

The level of works and services required prior to subdivision approval or building permit issuance are set out in Schedule "B" of this bylaw.

The Owner of the land being subdivided or developed is responsible for the expense of constructing and installing the required works and services to the standards established in this bylaw on the portion of a highway immediately adjacent to the site being subdivided or developed, up to the centre line of the highway.

4.2 Excess or Extended Services

Pursuant to Section 508 of the *Local Government Act*, the municipality may require that the Owner provide excess or extended services to promote access to, or service land, other than the land being subdivided or developed.

4.3 Requirements

The Owner of the land being subdivided or developed shall provide services as follows:

- a) Highways, sidewalks and boulevards shall be provided in accordance with Schedules "B" and "C" to this bylaw and shall be located and constructed to meet the standards set out in Schedule "A" to this bylaw.
- b) Where a water distribution system and fire hydrant system is required or, where no community water system is required and each newly created parcel is to be provided with a source of potable water, each shall be located, constructed and otherwise meet the standards set out in Schedules "A" and "B" of this bylaw.
- c) Where a sewage collection system is required or where no community sewage collection system is required and each newly created parcel is to be provided with an area of soil capable of disposing of a specified amount of effluent, each shall be located, constructed, and otherwise meet the standards set out in Schedules "A" and "B" of this bylaw.
- d) Where drainage collection system or a drainage disposal system is required, each shall be located, constructed and otherwise meet the standards set out in Schedules "A" and "B" of this bylaw.
- e) Where a street lighting system is required, each shall be located, constructed and otherwise meet the standards set out in Schedules "A" and "B" of this bylaw.
- f) Where underground wiring is required, each shall be located, constructed and otherwise meet the standards set out in Schedules "A" and "B" of this Bylaw. Where underground wiring is installed, but is not mandatory, it shall be located, constructed and otherwise meet the standards set out in Schedule "A" of this Bylaw.
- g) Overhead wiring may be considered at the discretion of the Approving Officer for some subdivisions; and, where such overhead wiring is to be provided, it shall be located, constructed and otherwise meet the standards set out in Schedule "A" of this bylaw.
- h) Natural gas services may, at the owner's option, be provided for some subdivisions; and, where such natural gas services are to be provided, they shall be located, constructed and otherwise meet the standards set out in Schedule "A" of this bylaw.

4.4 Completion of Works & Services

All works and services required to be constructed must be constructed and installed to the standards established in this bylaw before the Approving Officer approves of the subdivision and before the Building Inspector issues a building permit.

5.0 WORKS & SERVICING AGREEMENT

5.1 Despite Section 4.4, the Approving Officer may grant final approval of a subdivision or the Building Inspector issue a building permit prior to completion of the required works and services if the Owner first:

- a) Enters into a Works and Servicing Agreement with the Municipality; and
- b) Deposits with the Municipality security in the form and amount prescribed in this bylaw and, if applicable, a maintenance bond.

6.0 SECURITY & MAINTENANCE BOND

6.1 Security

Every Owner entering into a Works and Servicing Agreement with the Municipality shall deposit security in the form of a cash deposit or an irrevocable letter of credit from a financial institution in the amount of **120%** of the estimated cost of constructing and installing the required works and services as deemed acceptable to the Approving Officer or Building Inspector.

6.2 Maintenance Bond

All works and services required to be constructed are constructed or installed before the Approving Officer approves the subdivision or before the Building Inspector issues the building permit, the Owner shall be responsible for maintenance of required works and services for a period of two (2) years from date of subdivision approval or building permit issuance, and shall provide a maintenance bond in a form and amount satisfactory to the Approving Officer or Building Inspector before approval of the subdivision plan or issuance of the building permit.

7.0 SUBDIVISION APPLICATION FEES

- | | | |
|-----|--------------------------------------|--|
| 7.1 | Preliminary Application to Subdivide | \$50.00 |
| | Final Subdivision Application | \$500.00 for the 1 st parcel created
\$100.00 for each additional parcel
created by subdivision |

8.0 SITE PROFILES

- 8.1 Every applicant for subdivision approval shall submit a Site Profile in accordance with the Contaminated Sites Regulations and the Site Profile must be completed in all cases, even if the applicant would otherwise be exempt from submitting a Site Profile.

9.0 SCHEDULES

- 9.1 The following is a list of schedules attached hereto and which form a part of this bylaw:

Schedule "A" - Design Criteria, Specifications & Standard Drawings

Schedule "B" - Level of Works & Services

Schedule "C" - Level of Highway Works & Services

READ A FIRST TIME THIS 8TH DAY OF NOVEMBER 2016.

READ A SECOND TIME THIS 8TH DAY OF NOVEMBER 2016.

READ A THIRD TIME THIS 8TH DAY OF NOVEMBER 2016.

ADOPTED THIS 22ND DAY OF NOVEMBER 2016.



Taylor Bachrach
Mayor



Anne Yanciw
Corporate Administrator (CAO)

CERTIFIED A TRUE AND CORRECT COPY
of Bylaw No. 1800, cited as "Bylaw No. 1800 –
Subdivision Servicing and Development Standards"



Dianna Plouffe
Corporate Officer

SCHEDULE "A" TO BYLAW NO. 1800
Design Criteria, Specifications & Standard Drawings

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1.0 GENERAL INFORMATION

1.1 INTRODUCTION

Schedule "A" identifies the Design Criteria, Specifications & 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.

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 Town of Smithers or a duly authorized representative of the Municipality.

MUNICIPALITY means the Town of Smithers.

PROFESSIONAL ENGINEER means a person who is registered or duly licensed as such in British Columbia under the provisions of the *Engineers and Geoscientists Professional Act*.

THIS SCHEDULE means the "Design Criteria, Specifications & Standard Drawings" prepared by the Town of Smithers.

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 & USE

The Design Criteria, Specifications, and Standard Drawings are to be referred to, and incorporated in, subdivisions, developments, and on municipal properties or right-of-ways in the Town of Smithers.

1.4 NON-MUNICIPAL CODES & STANDARDS

Where non-Municipal codes and standards 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
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
TAC	Transportation Association of Canada
WCB	Worker's Compensation Board

2.0 ROADS & 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 Transportation Association of Canada (TAC) or as stated elsewhere in this Schedule or as accepted.

2.2 CLASSIFICATIONS

Roadway classification throughout the Municipality shall be as indicated in this bylaw. The distinction between major and minor local streets shall be at the discretion of the Approving Officer.

Arterial Street

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. Arterial streets include Provincial Highways.

Collector Street

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 to 1.5 km. Average daily traffic (ADT) volumes generally range from 1,000 to 12,000 vehicles.

Local Street

The main function of a 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. Trip lengths are short, generally under 0.75 km in length.

Commercial Streets

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.

Industrial Streets

Industrial streets provide primarily vehicle access to industrial developments. The volume of large vehicles is greater than on residential streets.

Cul-de-Sacs and P-Loops

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

Lanes

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

Walkways, Sidewalks & Multi-Use Pathways

A connected system of walkways, sidewalks and multi-use pathways provide pedestrian access to transit, shopping, schools, parks and other community amenities.

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 Transportation Association of Canada Geometric Design Standards for Canadian Roads and Streets Manual:

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

2.3.2 Cross Section Elements

All right-of-way and roadway widths shall comply with Table B.2 Minimum Highway Standards in Schedule "B" Level of Works and Services.

The Developer shall dedicate sufficient right-of-way to cover all road embankments or complete all road construction and site grading prior to registration of the subdivision plan. Where a cut or fill slope exceeds 1.5 m in vertical height, additional right-of-way may be required at the Approving Officer's discretion.

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 centerline radius for various superelevation rates for each classification of roadway. All designs to be in accordance with TAC Standards.

Table 2.3.3.1 Minimum Horizontal Curve Radii (Metres)

Road Classification	No Superelevation	Horizontal Curve Radii Superelevation (m/m)		
		0.02	0.04	0.06

Arterial:

	Provincial	Provincial Standards	Provincial Standards		
	Municipal	TAC Standards	1550	500	190
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 0.06m/m and for collectors shall be 0.04m/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
Arterial	9 m
Collector	8 m
Local	8 m
Cul-de-Sac	6 m
Industrial	9 m

Cul-de-Sac bulb radius for paved or graveled surface shall be a minimum of 8.5m to the inner edge of curb or outer edge of paved surface excluding graveled shoulders.

All roadways shall be constructed using a 3% centerline 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 crown as shown on the Standard Drawings.

2.3.4 Vertical Alignment

Roadway Grades

Minimum grades for urban and rural roadways shall be 0.50%. Special approval may be granted for minimum grades as low as 0.30% if other alternatives are not possible. Curb return grades shall be minimum 1.0%. Maximum grades shall be shown in Table 2.3.4.1.

Table 2.3.4.1 Maximum Roadway Grades

<u>Road Classification</u>	<u>Maximum Grade</u>
Arterial	8%
Collector	9%
Local	10%
Cul-de-Sac (uphill roadway)	10%
Cul-de-Sac (downhill roadway)	8%
Cul-de-Sac (through bulb)	7%
Industrial	10%
Lanes	10%

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 centerline 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 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 use for vertical curve design. All vertical curves are to be symmetrical.

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

<u>Roadway</u>	<u>Crest Curve</u>		<u>Sag Curve</u>	
Classification	Minimum	Desirable	With Street Lighting	Without Street Lighting
Arterial – TAC – Provincial Requirements				
Arterial – Municipal	17	25	15	25
Collector	10	15	9	20
Local	7	10	6	9

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 “Geometric Design Standards for Canadian Roads and Streets” as published by Transportation of Canada.

Intersection Grades

Approach grade 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 intersections shall be as shown in Table 2.3.5.

Table 2.3.5 Minimum Intersection K Values

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

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	Asphalt Thickness
Arterial	+550 mm	75 mm	75 mm
Collector	+475 mm	75 mm	65 mm
Local			
- Major Major	+475 mm	75 mm	65 mm
- Cul-de-sac Cul-de-Sac	+475 mm	75 mm	65 mm
- Industrial/Commercial Industrial/Commercial	+475 mm	75 mm	65 mm
Lane	+475 mm	75 mm	75 mm

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 75mm with 45mm to be installed during initial construction and the 30 mm remaining thickness to be installed when the roadway is completed by the subsequent developer.

2.3.7 Sidewalks, Walkways & Multi-Use Pathways

Sidewalks, walkways and multi-use pathways required as a condition of subdivision or building permit shall be located either within a dedicated road right-of-way or, with approval of the Approving Officer, within easements or statutory right-of-ways.

Location

Sidewalks, walkways and multi-use pathways shall be located and constructed according to road classification standards and zoning as shown in Schedule "B" Level of Works & Services.

Where sidewalk is required to be developed on one side of the street only, the following shall be required:

- a) In the case of two different zones abutting a street, sidewalk shall be constructed in accordance with the zone with the highest level of service.
- b) Where there is no sidewalk on either side of the street, sidewalk shall be constructed on the same side of the street as the subdivision or development.
- c) Where there is already a portion of sidewalk constructed on a given block, it shall be continued on the same side of the street, regardless of whether or not it abuts the subdivision or development. Excess or extended services may apply.

Additional sidewalks, walkways or multi-use pathways shall be installed in areas deemed necessary by the Approving Officer or Council. Such cases shall include multi-family, institutional and commercial development, along bus routes and pathway connections.

Sidewalks, walkways and multi-use pathways shall be designed as part of an overall pedestrian traffic system and shall be subject to the acceptance of the Approving Officer.

Pedestrian 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.

Materials & Design

All sidewalks and walkways in the downtown core, defined as "Downtown Commercial" in the Official Community Plan, shall be constructed of red brick paving stones (Cobble or Lock-pave) with a Grey Holland border at all edges and at the property line as required. All red brick paving stone sidewalks shall be constructed to prevent the growth of weeds or grass in the sand joints.

All sidewalks and walkways outside of the downtown core shall be constructed of concrete, or as required by the Approving Officer or Council.

Multi-use pathways shall be constructed of concrete, or other material as required by the Approving Officer or Council.

Material standards in this bylaw do not apply to the Perimeter Trail system.

Asphalt surfacing will only be considered for maintenance requirements where there is an existing asphalt surface.

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 3.5 m. Maximum crossing width for industrial driveways shall be 15.0 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.

Sidewalk crossings for lanes, industrial, commercial or multifamily dwelling developments shall be as per Standard Drawing No. B.06. Curing compound and sealing compound shall be applied according to the manufacturer's recommendations.

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

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

Walkways shall be graded 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 100mm 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. Hydro seeding may be permitted. Care shall be taken to avoid spreading grass seed on concrete paving stone sidewalks.

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 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. This requirement may be waived when the subdivision does not require any services to be provided.

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 Town Council who shall have absolute discretion in this regard.

2.3.11 List of Standard Drawings

The following drawings form part of Section 2:

Title	No.	Title	No.
Street Cross Section, Residential Local	B-01-1	Sidewalk Crossing & Curb Drop – Non-residential	B-06
Pavement Type 11mm Section, Residential and Collector	B-01-2	Crosswalks and Wheelchair Ramp	B-07
Pavement Type 14m Section, Arterial	B-02-3	Asphalt Overlay	B-08
Curb and Gutter – Residential Area	B-04-1	Culvert Installation	B-09
Curb and Gutter – Non-residential Area	B-04-2	Paved Lane	B-10
Transition Curbs	B-04-3	Hydrant Access Path	B-11
Sidewalk w/Cement or Asphaltic Concrete	B-05-1	Sandbag Bulkhead	B-12
Sidewalk, Walkway w/Interlocking Paving Stones	B-05-2		

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, screened if necessary, composed of inert, durable aggregate, uniform in quality and free from soft or disintegrated 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>
100mm	100
25mm	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.

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 grade from coarse to fine particles within the following gradation limits:

<u>Sieve Size</u>	<u>Percent Passing</u>
19mm	100
12.5mm	77-100
No. 4	40-80
No. 8	30-60
No. 16	20-45
No. 50	8-20
No. 200	2-9

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

No asphaltic concrete shall be incorporated into the works until the Municipal Engineer has approved the mix design.

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	75
Marshall stability, kg at 60°C	5344 Newtons
Flow index, mm	8-18
% voids in material aggregate	
– 20mm max.	14 min.
- 12.5mm 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>	% Passing	
	<u>Base Course</u>	<u>Surface Course</u>
19.0mm	100	--
12.5mm	80-100	100
9.5mm	68-86	78-94
No. 4	46-68	58-60
No. 8	30-60	52-74
No. 40	7-22	10-30
No. 100	4-12	4-12
No. 200	2-8	2-8

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 entering 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 Mpa, with a maximum aggregate size of 19mm, air entrainment 5-7%, water-cement ratio 0.50 maximum and slump of 25-75mm. Premoulded expansion joint filler material shall be minimum 13mm thick, cut to suit.

2.4.6 Grass Seed Mixture

Grass seed shall be a 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:

Kentucky Bluegrass	50%
Creeping Red Fescue	50%

2.5 INSTALLATION

2.5.1 General

Copies of compaction test results, granular materials sieve analysis, 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 inconveniences 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 & 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 BC Forest Act and Municipal Bylaws. Topsoil and overburden shall be stripped to a minimum depth of 300mm.

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 95% Standard Proctor. The completed profile and cross-section shall be accurate to a tolerance of 30mm, 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 150mm in uncompacted thickness, to a minimum 100% Standard Proctor Density. The completed profile and cross-section shall be accurate to a tolerance of 15mm, 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 12mm, free from ruts, waves and undulations.

2.5.6 Culverts

Culverts shall be concrete or galvanized corrugated steel pipe designed for H20 loading for local roads and HS25 loading for arterial and collector roads in accordance with AASHTO.

Culvert sizes shall be designed for the anticipated runoff, 10 year return period, and shall be minimum 300mm diameter. Driveway culverts shall be a minimum 7.0m 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 300mm bury. End walls shall be 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 & Gutter

All concrete work shall conform to the applicable CSA Standards. All curb and gutter 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 placed at each expansion joint, construction joint, beginning and end of curb with radius less than 15m, 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 3m in curb and gutter. Finish shall be broom-finished 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 un-contaminated 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 asphaltic 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 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 Health officer certificate prior to final inspection of any residence of commercial food, beverage or accommodation 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	680 litres/capita/day
Maximum domestic flow	1,590 litres/capita/day
Peak hour domestic flow	2,500 litres/capita/day

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

Fire flows shall be in accordance with the criteria outlined in "Water Supply for Public Fire Protection – A Guide to Recommended Practice", published by Fire Underwriters Survey.

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

<u>Zone</u>	<u>Required Fire Flow</u>
Single Family Residential	83 litres/sec
Apartments, Townhouses	125 litres/sec
Commercial	233 litres/sec
Institutional	233 litres/sec
Industrial	300 litres/sec

Design populations used in calculating water demand 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.

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	140 Kpa
(at hydrant, maximum day demand)	

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 183m. All mains exceeding 183m unless it is a temporary situation, shall be looped unless otherwise accepted. Dead-end mains shall not be promoted.

In residential area, watermains servicing fire hydrants shall be 150mm diameter or larger. Watermains 100mm 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 75m long. Where a dead-end main is longer than 183m or services more than one hydrant, watermain shall be 200mm diameter or larger. In commercial/industrial/institutional areas, the minimum watermain size shall be 200mm 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 of 6.0m 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 1.8 metres.

The minimum grade for a main shall be 0.1%. The maximum grade shall be 10.0% 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 crossing sanitary sewer shall be 450mm unless the watermain is adequately encased with concrete encasement. The minimum vertical clearance to piping other than sanitary sewer shall be 300mm unless the watermain is adequately encased in concrete.

The minimum horizontal clearance between a watermain and any parallel sewer shall be 3.0m 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 projection of property lines, to avoid conflicts with curbs and sidewalks.
 - i) 3 valves at "X" intersection
 - ii) 2 valves at "T" intersection

so that specific section of mains may be isolated.

- b) Not more than 240m apart, or 20 services, whichever is less, for a 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 300mm diameter. Gate valves may be used up to and including 300mm diameter. Butterfly valves shall be required in mains larger than 300mm. 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 850mm offset from the centre of corner cuts. Where hydrants are required at mid-block locations, they shall be installed opposite property pins at a 2m offset. In no case shall fire hydrant spacing exceed a distance of 200m nor should any residence be more than 90m from a hydrant.

In high density residential, commercial, and industrial areas, hydrants shall be located at a maximum spacing of 100m 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 450mm 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 200mm diameter and larger except where the difference in grade between the summit and valley is less than 600mm. Chamber insulation and drainage shall conform to that specified for butterfly valve chambers.

A 50mm diameter standpipe shall be installed on all dead-end mains. Standpipes shall be installed at a depth of 300mm in a box below grade as shown on the standard drawings. The top end of the standpipe shall be equipped with a 50mm female IPT x 62mm male fire thread fitting.

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 300mm 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 50mm 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 19mm to 50mm 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	19mm diameter
Other	25mm diameter

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

Connections shall be installed up to the property line at a minimum depth of 1.8m. All services shall be marked with a 40mm X 90mm stake at the property line with the top 150mm painted blue and marked with the length of the stake in meters. Curb stops shall be located at a 300mm offset from property line and shall be extended to ground level.

3.2.9 List of Standard Drawings

The following drawings form part of Section 3:

Title	No.
Underground Trench Excavation and Backfill	C-01
Trench Bedding Details	C-02
Trench Anchor Blocks	C-03
Encasement Pipe Detail	C-04
Thrust Block (1)	C-11-1
Thrust Block Vertical Bends (2)	C-11-2
Valve Box	C-12
Fire Hydrant	C-13
Air Release Valve	C-14
Water Service Connection – 55mm or less	C-15-1
Extension Service Box Detail	C-15-2
Butterfly Valve Chamber	C-18
Standpipe Detail	C-19

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. Depending upon the purpose of the development, storage of water for fire protection may be required by the Approving Officer.

Where a private water source is required, the water provided must be potable water certified for drinking purposes by the 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</u> <u>(mm)</u>	<u>SPECIFICATION</u>	<u>USE</u>
Kitec	19-25	ASTM F1281, CSA B137, 10	Service connection
Polyethylene	50	ASTM PE 2036, series 160 CSA B 137-1	Service connection
Polyvinyl Chloride	100-300	AWWA C900, Class 150 (bell & spigot joints)	Distribution mains and service connections
Ductile iron	100-450	AWWA C151 cement mortar lined, C104 (rubber gasket or mechanical joints) AWWA C111	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 AWWA C500 specifications and combined with extension spindles and valve boxes shall be installed on all watermains up to and including 300mm diameter. Valve manufacturer must be acceptable to the Approving Officer.

On mains larger than 300mm in diameter, butterfly valves, flanged type conforming to AWWA C504 specifications along with an insulated valve chamber shall be installed. Valves larger than 300mm shall have a 100mm 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 Nelson Type, or as approved. 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.

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 Model C-71 or C-71P or Canada Valve Model "Century" and shall conform with AWWA Specification C502 and shall be flanged at 50mm above the ground line. Hydrants shall have two hose nozzles and one pumper nozzle complete with caps. Hose nozzles shall be 63mm in diameter and pumper nozzles 100mm in diameter. Nozzle

threads shall conform with British Columbia Fire Hose Thread Specifications, 6 threads per inch for 100mm port and 8 threads per inch for 63mm port.

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 tie rods. Thrust blocks may be permitted for thrust restraint.

3.3.5 Service Connections

Corporation stops shall be in accordance with AWWA C800, with fittings ends suitable for use with compression fittings Ford F1000 and FB 1000 unless otherwise approved. Service saddles for connections to PVC and existing AC piping shall be double strap type. Corporation couplings shall be in accordance with AWWA C800.

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

Curb stops shall be Cambridge Brass unless otherwise 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 with 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 150mm, maximum 400mm, from the bottom of the trench to 100mm above the top of the pipe.

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

Bedding material shall be crushed gravel or concrete for PVC or ductile iron pipe or sand for polyethylene service pipe. 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 750mm 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.

All pipes shall be laid on horizontal line, with a tolerance of plus or minus 10mm of the design line; and grade, with a tolerance of plus or minus 25mm 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 joint is made shall be kept to an absolute minimum. Jumping on or dropping of the 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 centerline, unless otherwise accepted. Drain outlets with drain rock shall be provided and kept free of obstructions. The ground flange shall be 50mm 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 25MPa minimum at 28 days.

Care shall be taken to ensure that concrete does not interfere with the operation of the 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 1,035kPa 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:

$$L = \frac{N \times D \times P^{0.5}}{130,740}$$

L = allowable leakage in litres per hour

N = number of joints in test section

D = inside diameter of pipe in millimeters

P = test pressure in kilopascals

Service connections shall be tested with the water main. Allowable expansion for polyethylene service piping shall be as specified by the manufacturer.

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 "pigged" or flushed of dirt and other debris. Chlorination methods shall conform to AWWA 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, Environmental 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 = 550 litres/capita/day

Industrial/Commercial = 22,500 litres/day/hectare

An infiltration rate of 1,849 litres/day/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, follow 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 AC or Concrete Pipe
= 0.011 for PVC Pipe

Calculations for capacities of sanitary sewer force mains 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 Manhole and Hydraulic Losses

Manholes shall be required at:

- All changes in grade
- All changes in direction
- All changes in pipe size
- 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 150m 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° - 25mm drop
- iii) Deflections 45° to 90° - 30mm drop

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

Inside ramps will be permitted up to 450mm 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 4.25m shall be provided with safety platforms in accordance with the Worker's Compensation Board requirements.

4.2.4 Temporary Cleanouts

Temporary cleanouts 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 45.0m.
- c) The depth of the pipe does not exceed 2.0m at the terminal point, and
- d) No more than two (2) service connections are to be installed between the cleanout and the downstream manhole.

Cleanouts shall not be considered a permanent structure.

4.2.5 Minimum Pipe Diameter, Velocity, Grades and Cover

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

- a) Sanitary Sewer Mains = 200mm
(except last upstream portion which cannot be extended in the future, may be 150mm diameter if less than 45m long.)
- b) Sanitary Sewer Connections = 100mm
- c) Sanitary Sewer Forcemains = 100mm

The minimum velocity shall be 0.6m/sec. There is no maximum velocity, however, consideration must be given to scour problems where flow exceed 2.5m/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 the a main that will not be extended in the future, shall have a minimum grade of 1.0% where 150mm diameter pipe is proposed.

The minimum cover over any gravity main shall be 1.4m. The minimum cover over any sewer foundation is 1.8m. 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 60m.

The design velocity must exceed 0.91m/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 6.0m 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 Code.

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 using saddles.

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

Desirable depth shall be 1.4m at the property line.

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 40mm X 90mm stake at the property line. The top 150mm 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 0.9m/sec should be maintained. Maximum velocity should not exceed 3.5m/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 600mm 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 100mm 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:

Title	No.	Title	No.
Underground Trench Excavation & Backfill	C-01	Sanitary Sewer Drop Manhole	C-21-2
Trench Bedding Details	C-02	Sanitary Manhole Benching	C-21-3
Trench Anchor Blocks	C-03	Manhole Frame and Cover	C-22-1
Encasement Pipe Details	C-04	Cleanout for Sewer Main	C-23
Sanitary Sewer Manhole	C-21-1	Sanitary Sewer Service Connection	C-24

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 Health officer, shall be located on each parcel, and not similar than the following as determined by the percolation rate of the soil in that area:

Percolation Rate (min/2/5cm)	Minimum Size of Area of Soil (Square Metres)
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 120cm 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 120cm to demonstrate this.

The area of soil required for sewage disposal shall be capable of meeting this sitting and setback requirements for absorption fields in the Sewage Disposal Regulations.

Percolation tests are subject to the certification of the Health officer, BC 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 300mm 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 testholes 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 filing (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 for 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

<u>Material</u>	<u>for</u>	<u>Size Range</u>	<u>Minimum Specification</u>	<u>Use</u>
<u>Gravity Sewers</u>		<u>(mm)</u>		
Polyvinyl		100-150	CSA B182.1, SDR 28	Collection
Chloride		200-375	ASTM, D3034, SDR 35	Mains and service connections
Reinforced Concrete		300 & larger	ASTM C76, Class III	Major trunk mains

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</u>	<u>for</u>	<u>Size Range</u>	<u>Minimum Specification</u>	<u>Use</u>
<u>Gravity Sewers</u>		<u>(mm)</u>		
Polyvinyl		100 & larger	AWWA C900	Minor
Chloride				Forcemains

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 1,050mm inside diameter and shall conform to ASTM C478. Manholes slabs shall be precast or cast in place on compacted material to Municipal Standards using 20 MPA concrete and shall be 1,600mm 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

Pipe shall be handled with the greatest care and equipment designed so that no damage occurs to pipe and 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. Vertical tolerance shall be 7mm, plus or minus, for sanitary sewer gravity mains and 25mm, plus or minus for sewer force mains.

All pipes shall be laid to horizontal line 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 recommendation tolerances. Care shall be taken to properly align the pipe once the joints are forced home. Movement of the pipe once the joint 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.

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 drawing 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, or by TV Inspection 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 force mains shall conform to the testing criteria for water mains, but need not include disinfection.

Exfiltration Test:

The allowable exfiltration (water method) shall be 4 litres per millimeter 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 25kPa and maintaining a pressure above 20kPa for a minimum of 5 minutes. After the stabilization period, the air

supply shall be cut off and the pressure allowed to drop to 20kPa. Timing shall commence at 20kPa and shall continue until the pressure reaches 15kPa. The minimum acceptable time period shall be determined by the formula:

Minimum Time in minutes = $0.040 \times \text{pipe diameter in millimetres}$.

Where prevailing groundwater is above the sewer line being tested, the test pressure shall be increased 10kPa 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, and shall be in conformance with the latest edition of the Municipality's Stormwater Master Plan.

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 five 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 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 a 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 storm sewer mains and open channels shall be determined by using Manning's Formula:

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

Where:

Q =	Design Flow in m ³ /sec
A =	Cross Sectional Area in m ²
R =	Hydraulic Radius in m

S =	Slope of hydraulic grade line in m/m
N =	Roughness coefficient
=	0.011 for PVC Pipe
=	0.013 for AC or Concrete 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 = 300mm
- b) Catch Basin Leads = 200mm
- c) Storm Sewer Service = 100mm (Residential/Single Family)
Connections = 150mm (All Others)
- d) Driveway Culverts = 300mm

Storm sewer mains shall be installed with a minimum clear cover above the pipe crown of 1.2m.

Unless otherwise accepted, the minimum velocity for pipes flowing full or half full shall be 0.75m/s.

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

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

5.2.4 Manholes & 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 150m. Increase spacing on sewers larger than 375mm 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 120m.

5.2.5 Inlet & 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 minimum design requirements:

a) **Endwall**

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

b) **Wingwalls**

Used to transition outlet and inlet to existing channel shape. Wingall 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 dissipaters shall be installed as required.

e) **Trash Grate**

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

f) **Sedimentation Devices**

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 mixture containing the following shall be applied at a rate of 170kg/ha

Kentucky Bluegrass	50%
Creeping Red Fescue	50%

b) Fertilizer (10-55-0) or approved formula at a rate of 170kg/ha.

c) The hydro seeding solution should contain a mulch of wood cellulose fibre free of growth and germination inhibiting ingredients, and dyed green for visual metering during application. This mixture shall be applied at a rate of 2,250ka/ha.

Energy dissipaters may be required if deemed necessary to prevent erosion. 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 150mm diameter and shall be installed up to property line at a minimum depth of 1.2m. All services shall be marked with a 40mm x 90mm stake at the property line. The top 150mm of the stake shall be painted green.

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

5.2.8 Trench Drains & 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:

Title	No.	Title	No.
Underground Trench Excavation & Backfill	C-01	Catch basin – Location and Construction	C-32-1
Trench Bedding Details	C-02	Catch basin – Frame and Grate	C-32-2
Trench Anchor Blocks	C-03	Sump/Storm Sewer Discharge	C-33
Encasement Pipe Details	C-04	Oil Interceptor	C-34
Manhole Frame and Cover	C-22-1	Storm Sewer Outlet – 200mm	C-35-1
Storm Sewer Manhole – 400mm or smaller	C-31-1	Storm Sewer Outlet – 300mm	C-35-2
Storm Sewer Manhole – 450mm to 1,200mm w/junction	C-31-2		
Storm Sewer Manhole – 450mm to 1,200mm w/o junction	C-31-3		

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

Material	Size Range (mm)	Minimum Specification	Use
Reinforced Concrete	300 & larger	ASTM C76, Class III	Major trunk mains, culverts
Polyvinyl Chloride	100-150	CSA B182.1 SDR28	Service connections
	200-375	ASTM, D3034, SDR 35	Minor collection mains & service connections
	450-600	ASTM, F670, SDR 35 equivalent or ASTM F794	Minor collection mains & service connections
Corrugated Steel Pipe	300 & larger		Culverts, collection mains on steep grades

5.3.2 Pipe Joints

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

5.3.3 Manholes

Manhole barrels shall be precast concrete, 1,050mm minimum inside diameter and shall conform to ASTM C478 for all mains up to 380mm in diameter. For mains 400mm 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 20MPa concrete and shall be 1,600mm 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° =	20mm drop
Deflections to 45° to 90° =	30mm drop

5.3.4 Catch Basins

All catch basins shall be precast concrete 750mm 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 200mm diameter and shall be installed a minimum of 460mm for 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

Polyvinyl chloride pipe shall be used for all service connections unless otherwise approved.

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 4.4.2 of this Schedule. Vertical tolerances shall be 7mm, plus or minus for storm sewer gravity mains.

5.4.3 Manholes, Catch Basin & Appurtenance

Manholes, catch basins, and appurtenances shall be installed at the locations shown on the approved design drawings and in accordance with the Standard Drawings on 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 & Testing

Prior to flushing and testing, all new mains are to be cleaned of debris by passing a line sized "pig" through the main or by TV Inspection 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 grade to line, width and grade as shown on the approved drawings. Culverts, inlet and outlet structures, energy dissipaters 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 Engineering 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 provisions 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 or his appointed agent and correction of remaining deficiencies, the Municipality will then make application to energize the system when service is required.

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	6	6	4
Walkways			

**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

Road Classification	Uniformity Average: Minimum
Arterial	3:1
Collector	4:1
Local	6:1
Pedestrian Walkways	6:1

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 conflict exists.

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	Standard		Luminaire
Classification	Type	Height	Description
Arterial	Davit Arm NAPCO	9.14m	150 watt high pressure sodium
	#29180-110-000		Powerlite LX8C2227S-150 c/w
	as per std. dwg.		Sylvania LU 150/55/D deluxe coated lamp or as accepted.
Collector	Davit Arm NAPCO	7.62m	150 watt high pressure sodium
	#29180-110-000		Powerlite LX8C2227S-150 c/w
	as per std. dwg.		Sylvania LU 150/55/D deluxe coated lamp or as accepted.
Local	Davit Arm NAPCO	7.62m	100 watt high pressure sodium
	#29180-110-000		Powerlite LX8C2227S-100 c/w
	as per std. dwg		Sylvania LU 100/D deluxe coated lamp
	or accepted post-top	6.0m	or as accepted.
Pedestrian Walkways	Accepted post-top	6.0m	As accepted.

Standards for combination traffic signal – street light poles shall be in accordance with municipal standards.

6.2.5 List of Standard Drawings

The following drawings form part of Section 6:

Table 6.2.5 – Standard Drawings

Title	No.
Street Light Pole – Residential Area	E-01-1
Street Light Pole – Commercial Area	E-01-2
Base for Light Poles	E-02
Junction Box	E-03
Service Pole	E-04
Handhole Wiring	E-05
Service Base Schematic	E-06
Conduit Trench Details	E-07

6.3 MATERIALS

All materials shall be CSA approved and conform to the following specifications:

6.3.1 Poles

Poles shall be one piece octagonal tapered, hot dipped galvanized steel to ASTM Standard A153 (610gms/m² inside and outside) designed to withstand 160km/h wind loading. All poles shall be refinished after installation to cover damaged areas. Street light poles and accessories shall be 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 CSA certified cement. Steel conduit for power services 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 PVC 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.

Polycarbonate vandal resistant refractors are required.

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-8. 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 CSA 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 1,000 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. Where adjacent luminaries are controlled by individual photocells, they shall be adjusted to activate at the same light level.

6.3.13 Ground Rods

Ground rods shall be 19mm diameter steel with hot forged point. Top ends shall be galvanized for a minimum distance of 250mm for 1,500mm rods and 450mm for 3 metre rods. Ground rods shall be full length copper clad.

6.3.14 Paint

Primer shall be Pittsburg No. SN1120 or approved equal, and paint shall be Pittsburg No. VN3366 or approved equal. Colour shall be as accepted.

6.4. INSTALLATION

6.4.1 Layout & 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 centerline 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 & 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, leveled and cleaned after pole erection.

6.4.4 Wiring & Equipment

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

6.4.5 Inspection & Testing

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

6.4.6 Installation of 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 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 & CABLEVISION

Telephone and cablevisions services are required in accordance with Section 5 of this Bylaw.

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 5-10mm below finished paved asphalt road grade, and 20-25mm 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.

8.2 LIST OF STANDARD DRAWINGS

Table 8.2 – Standard Drawings

Title	No.
Street Cross Section, Residential Local	B-01-1
Pavement Type 11m Section, Residential and Collector	B-01-2
Pavement Type 14m Section, Arterial	B-02-3
Curb and Gutter – Residential Area	B-04-1
Curb and Gutter – Non-Residential Area	B-04-2
Transition Curb	B-04-3
Sidewalk, Walkway w/Cement or Asphaltic Concrete	B-05-1
Sidewalk, Walkway w/Interlocking Paving Stones	B-05-2
Sidewalk, Crossing and Curb Drop – Non-Residential	B-06
Crosswalks and Wheelchair Ramp	B-07
Asphalt Overlay	B-08
Culvert Installation	B-09
Paved Lane	B-10
Hydrant Access Path	B-11
Sandbag Bulkhead	B-12
Underground Trench Excavation and Backfill	C-01
Trench Bedding Details	C-02
Trench Anchor Blocks	C-03
Encasement Pipe Detail	C-04
Thrust Block (1)	C-11-1
Thrust Block Vertical Bends (2)	C-11-2
Valve Box	C-12
Fire Hydrant	C-13
Air Release Valve	C-14
Water Service Connection – 50mm or less	C-15-1
Extension Service Box Detail	C-15-2
Butterfly Valve Chamber	C-18
Standpipe Detail	C-19
Sanitary Sewer Manhole	C-21-1

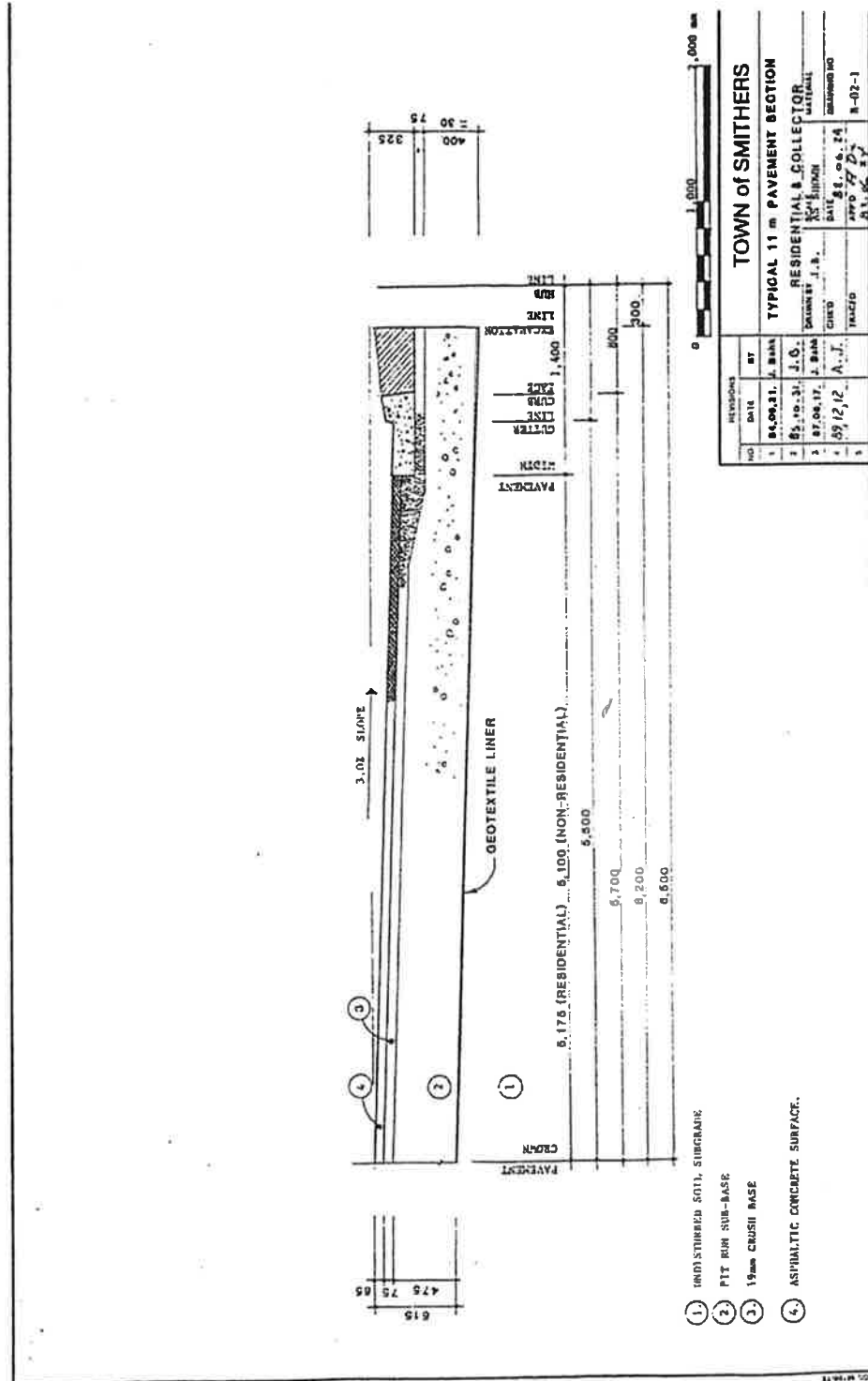
Sanitary Sewer Drop Manhole	C-21-2
Sanitary Manhole Benching	C-21-3

Table 8.2 – Standard Drawings

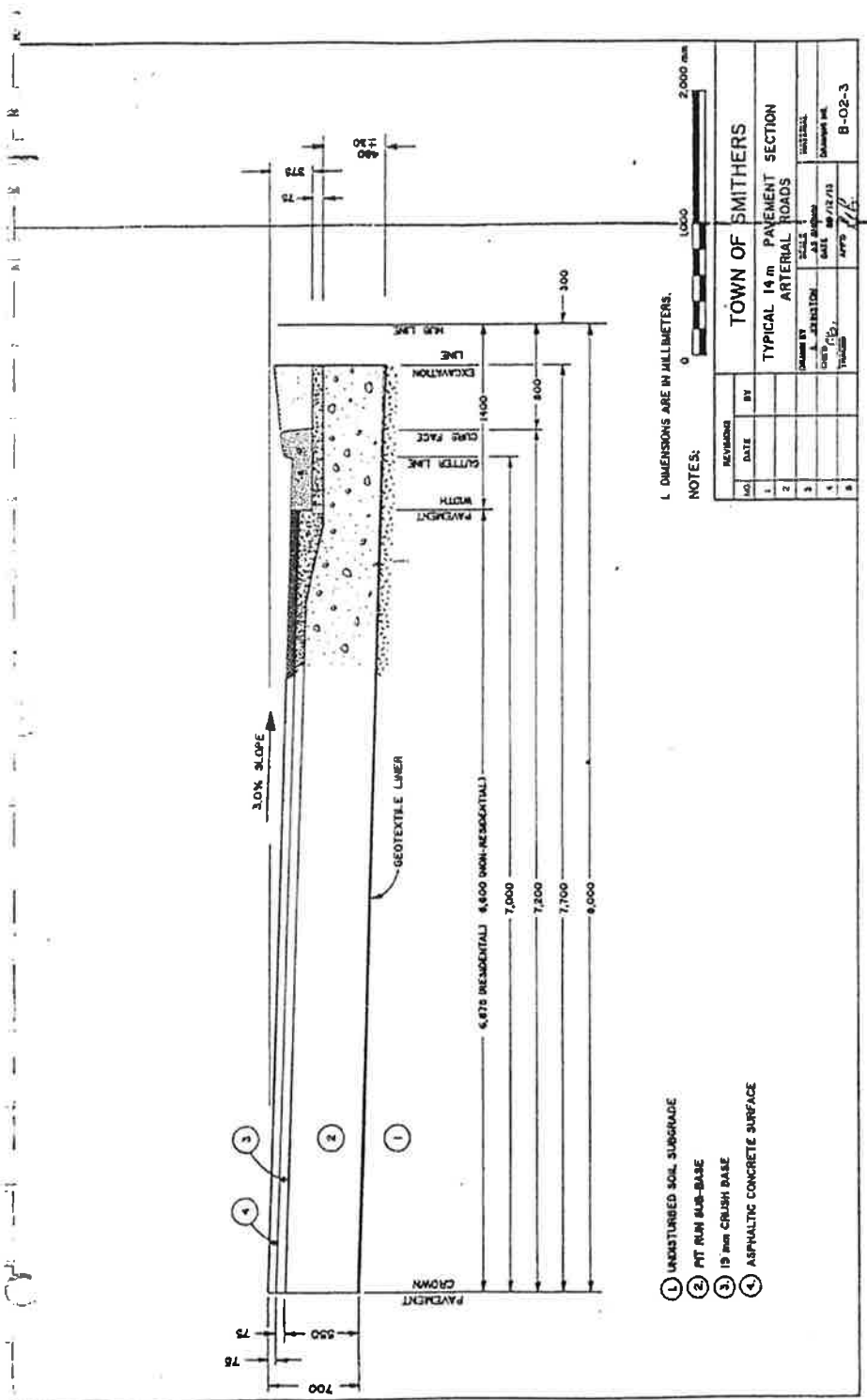
Title	No.
Manhole Frame and Cover	C-22-1
Cleanout for Sewer Main	C-23
Sanitary Sewer Service Connection	C-24
Storm Sewer Manhole – 400mm or Smaller	C-31-1
Storm Sewer Manhole – 450mm to 1,200mm w/Junction	C-31-2
Storm Sewer Manhole - 450mm to 1,200mm w/o Junction	C-31-3
Catchbasin – Location and Construction	C-32-1
Catchbasin – Frame and Grate	C-32-2
Sump/Storm Sewer Discharge	C-33
Oil Interceptor	C-34
Storm Sewer Outlet – 200mm	C-35-1
Storm Sewer Outlet – 300mm	C-35-2
Street Light Pole – Residential Area	E-01-1
Street Light Pole – Commercial Area	E-01-2
Base for Light Poles	E-02
Junction Box	E-03
Service Pole	E-04
Handhole Wiring	E-05
Service Base Schematic	E-06
Conduit Trench Details	E-07

DRAWING B-01-1

DRAWING B-02-1

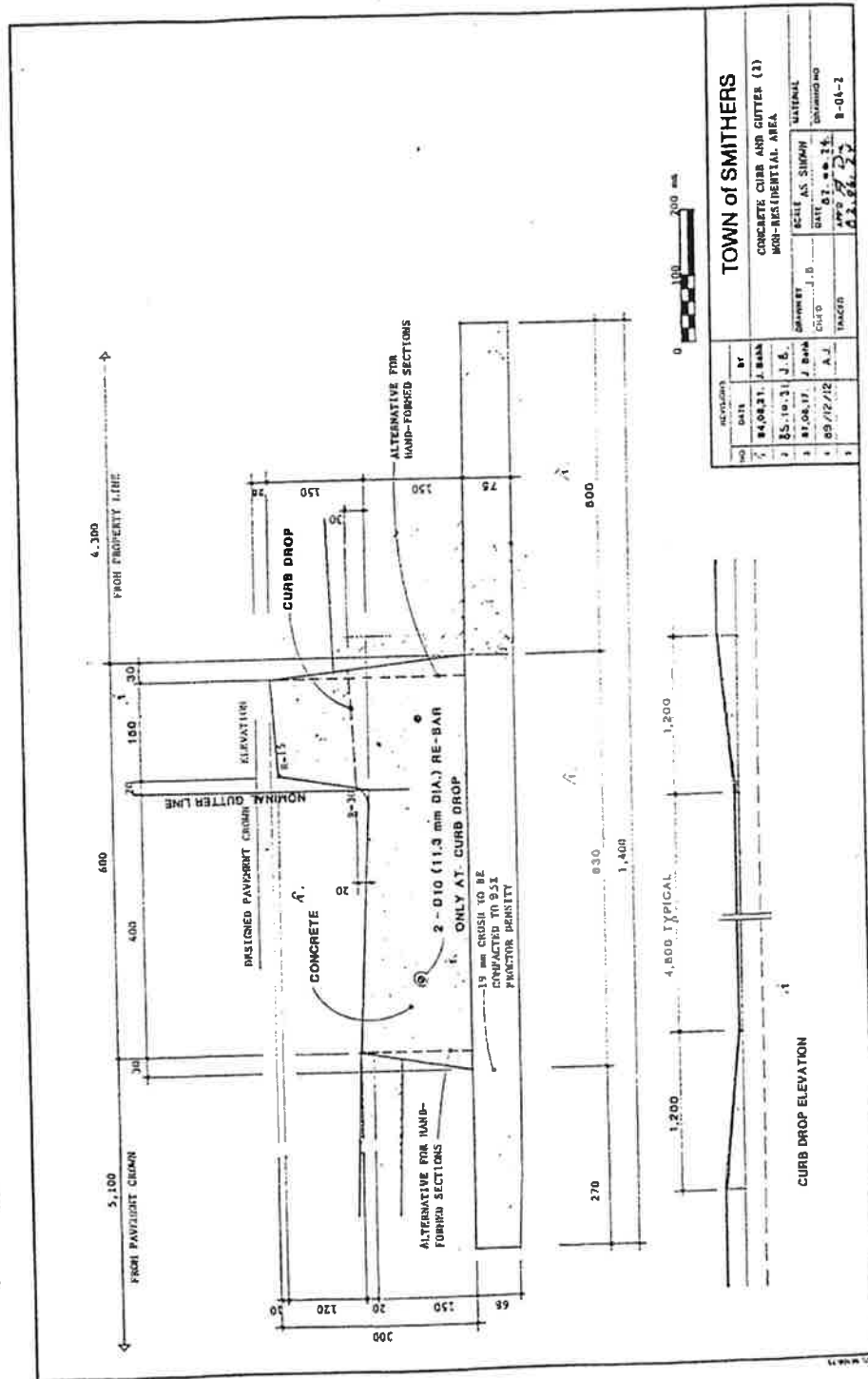


DRAWING B-02-3



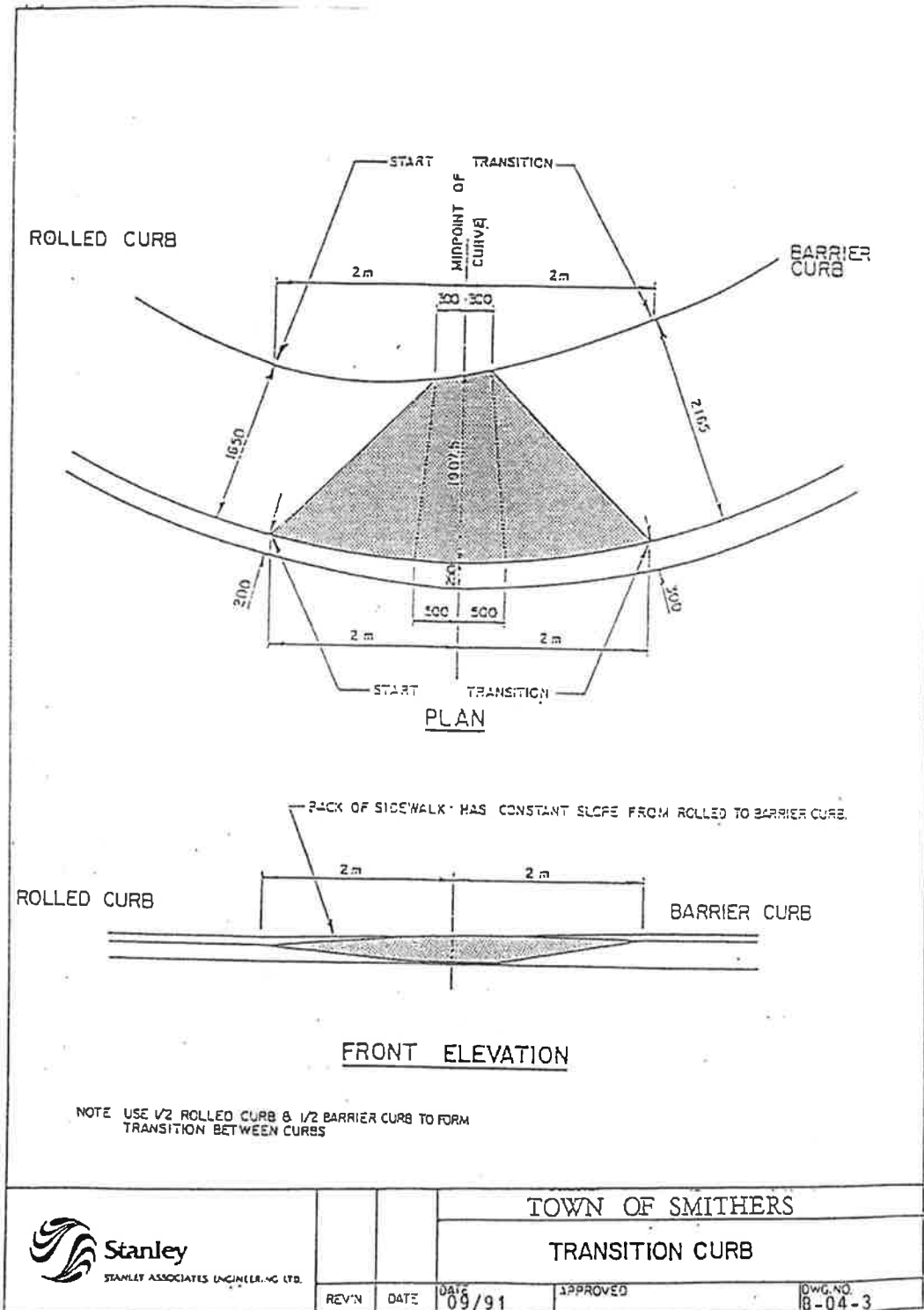
DRAWING B-04-1

DRAWING B-04-2

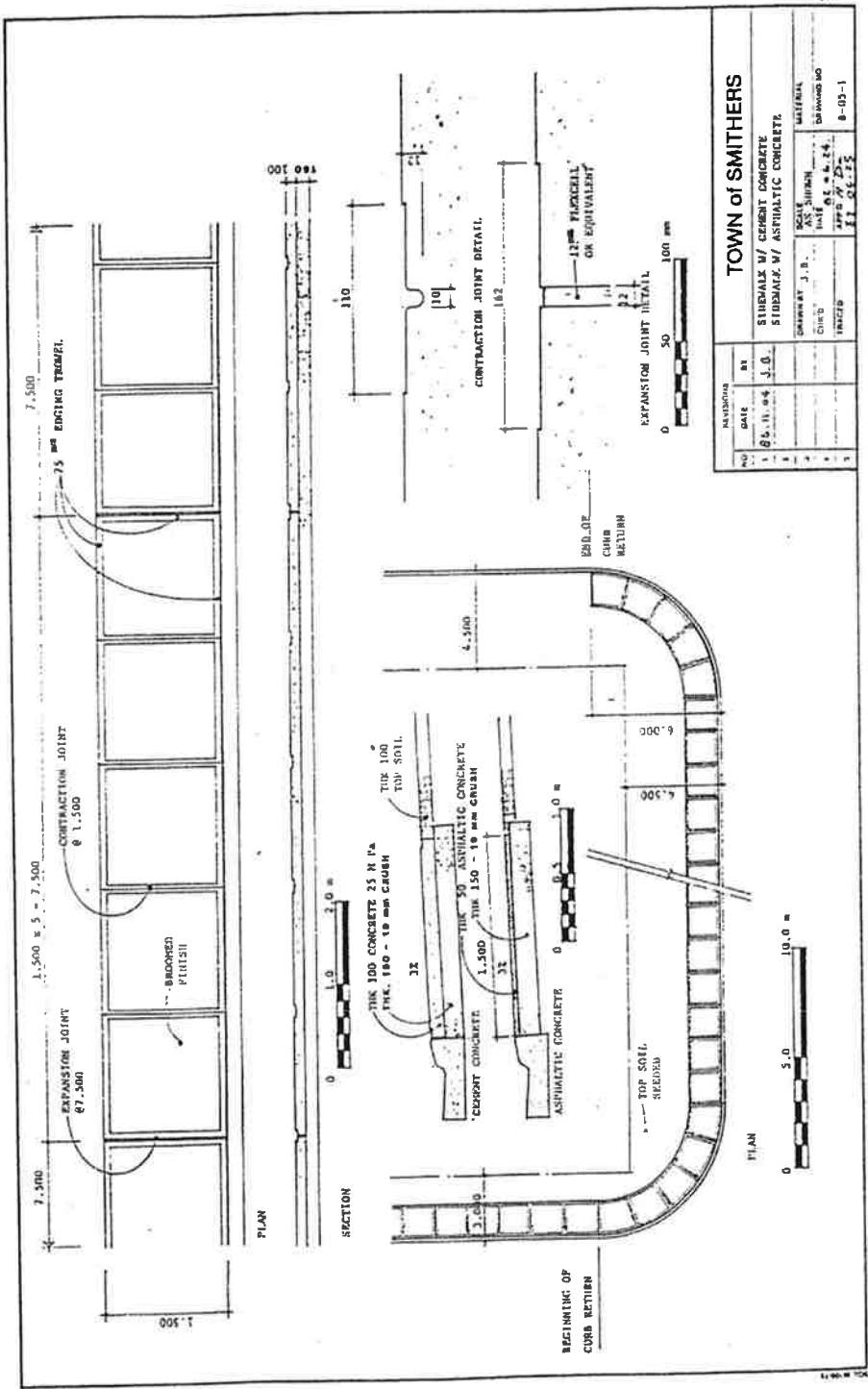


TOWN OF SMITHERS			
CONCRETE CURB AND GUTTER (1)			
NON-RESIDENTIAL AREA			
REV	DATE	BY	DESCRIPTION
1	84.08.31	J. BAH	ISSUED
2	85.10.31	J. B.	SCALE AS SHOWN
3	87.08.17	J. BAH	DATE 87.08.17
4	89.12.12	A.J.	DATE 89.12.12
DRAWN BY			DATE 87.08.17
CHECKED BY			DATE 89.12.12
TACED BY			DATE 89.12.12
PROJECT NO.			B-04-2

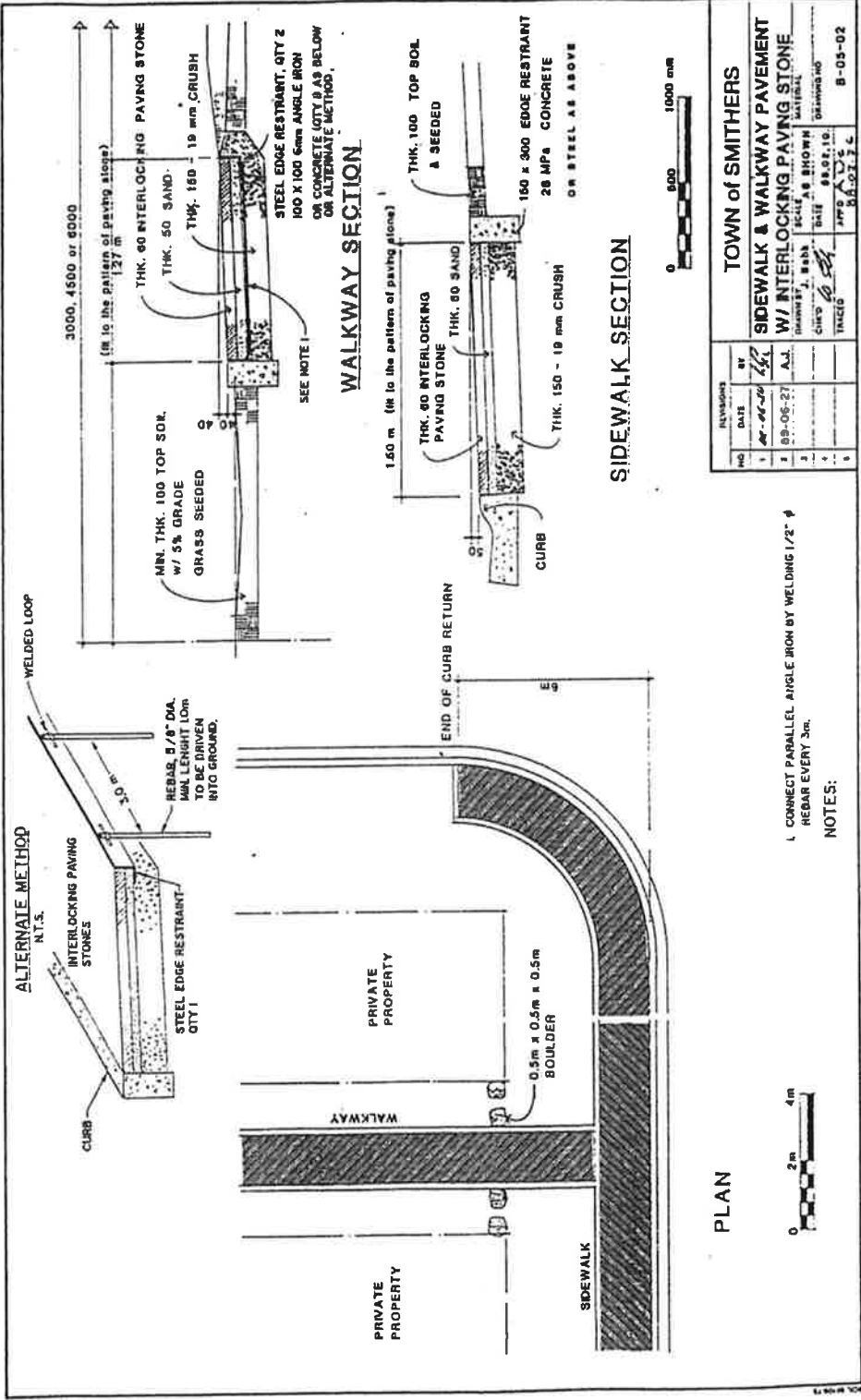
DRAWING B-04-3



DRAWING B-05-1

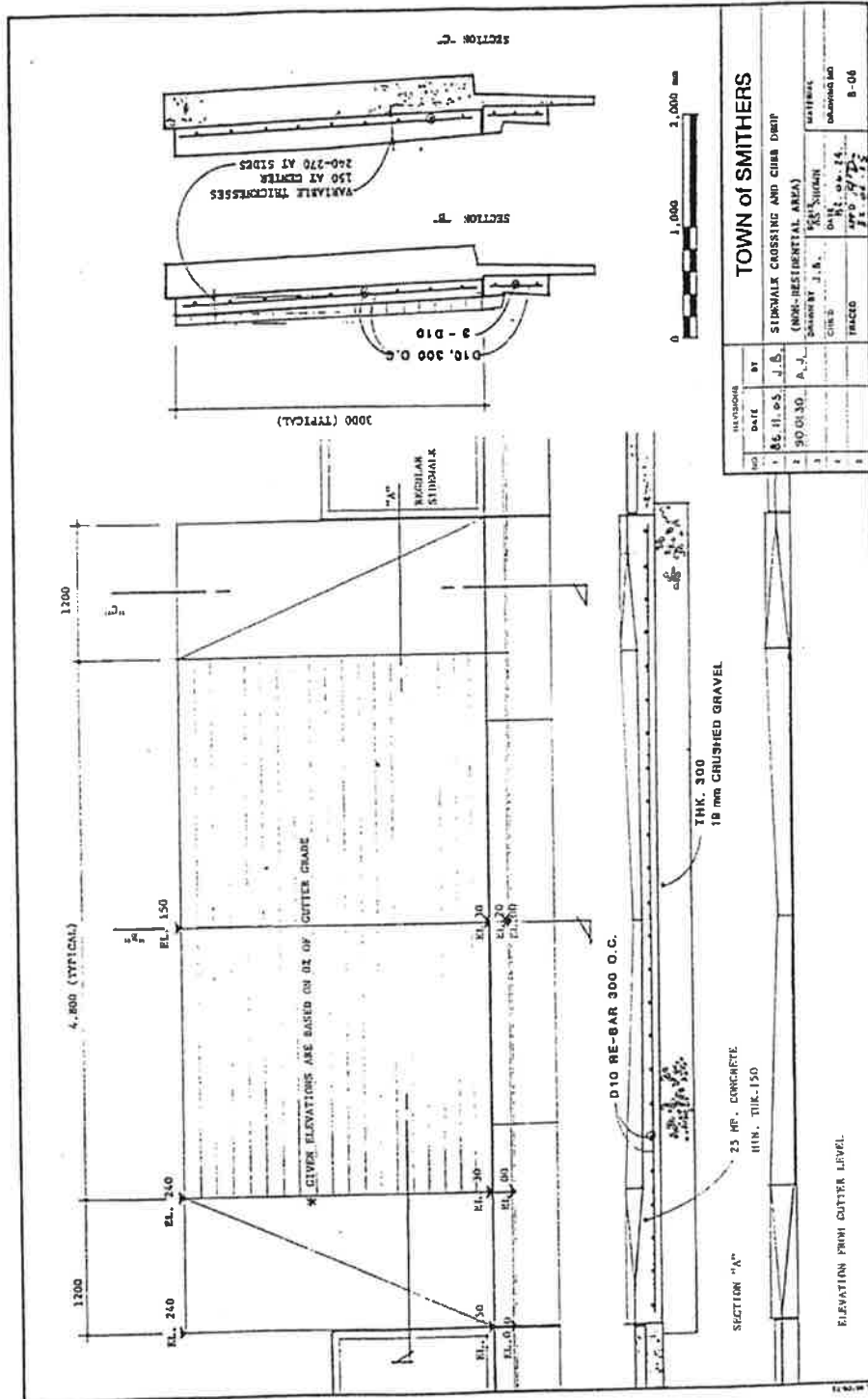


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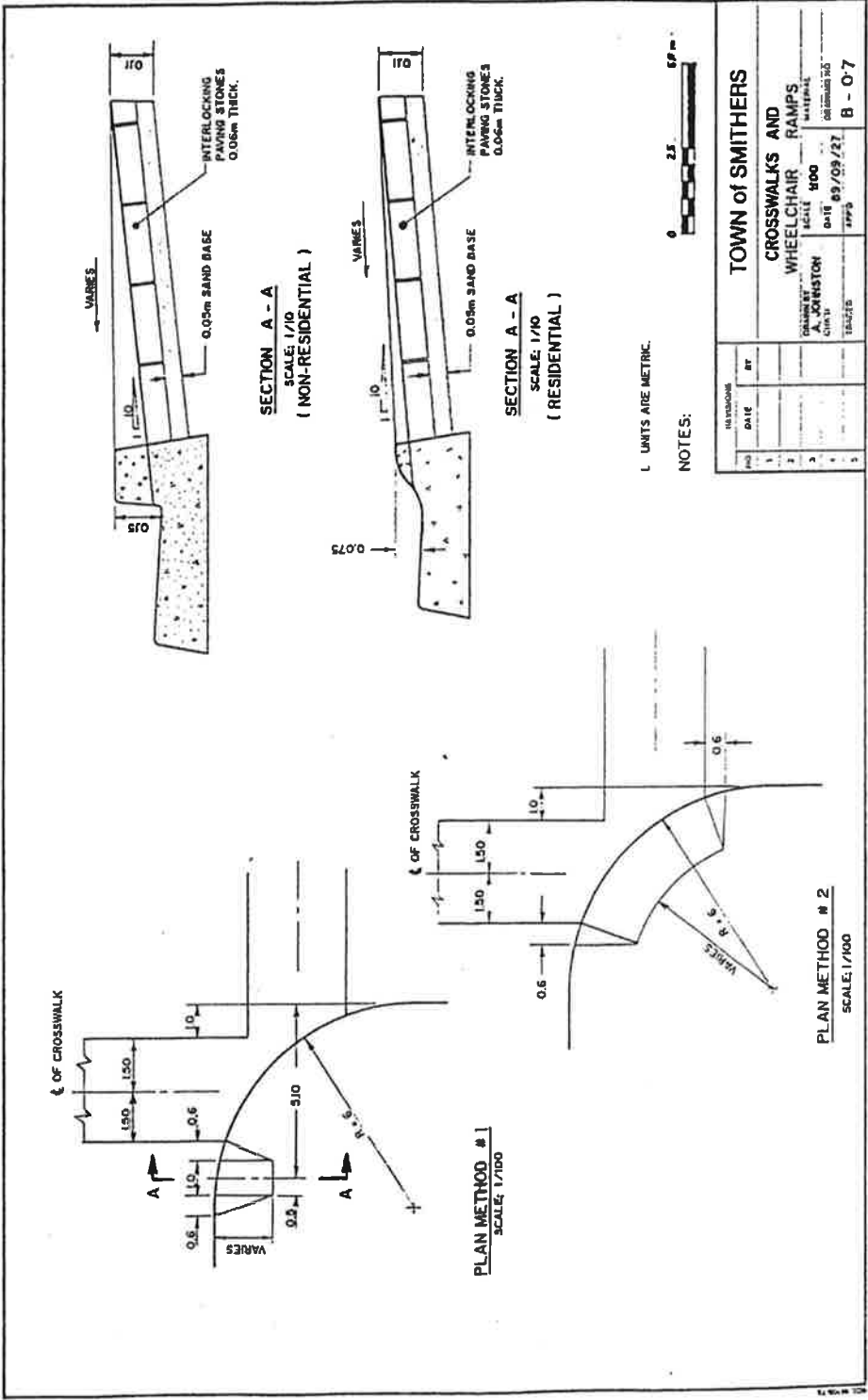


TOWN OF SMITHERS
SCHEDULE "A" TO BYLAW NO. 1800
 Page A-78

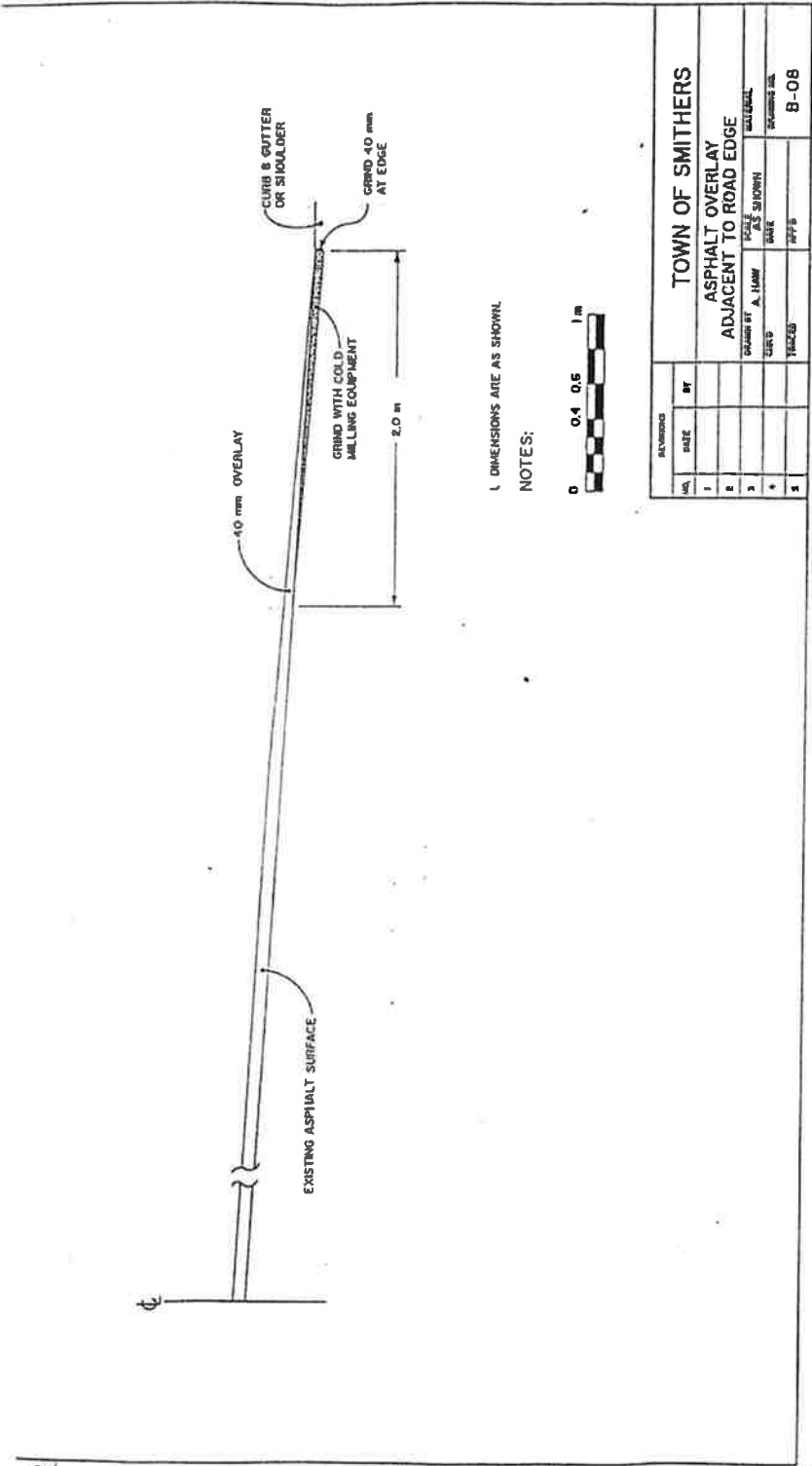
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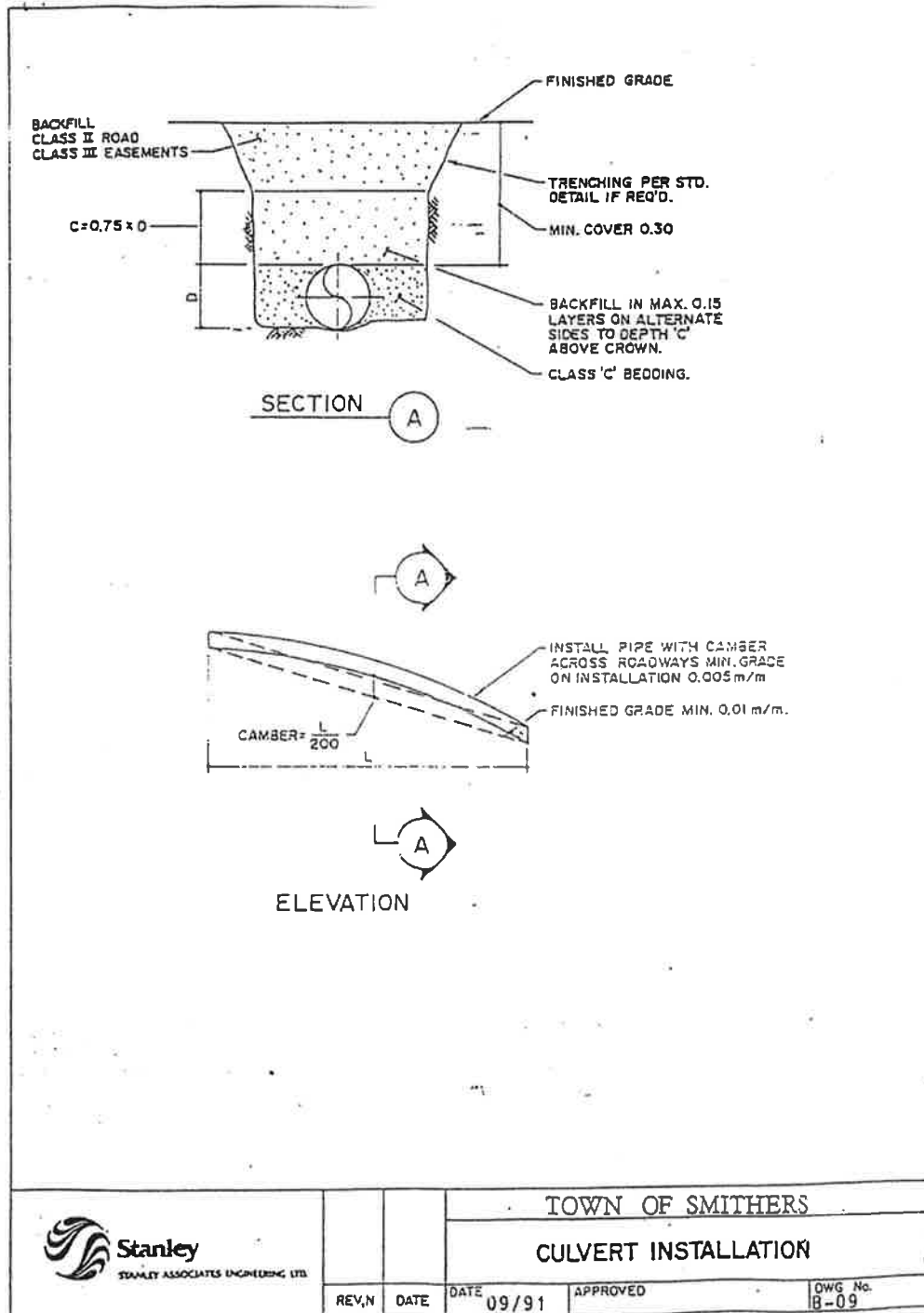
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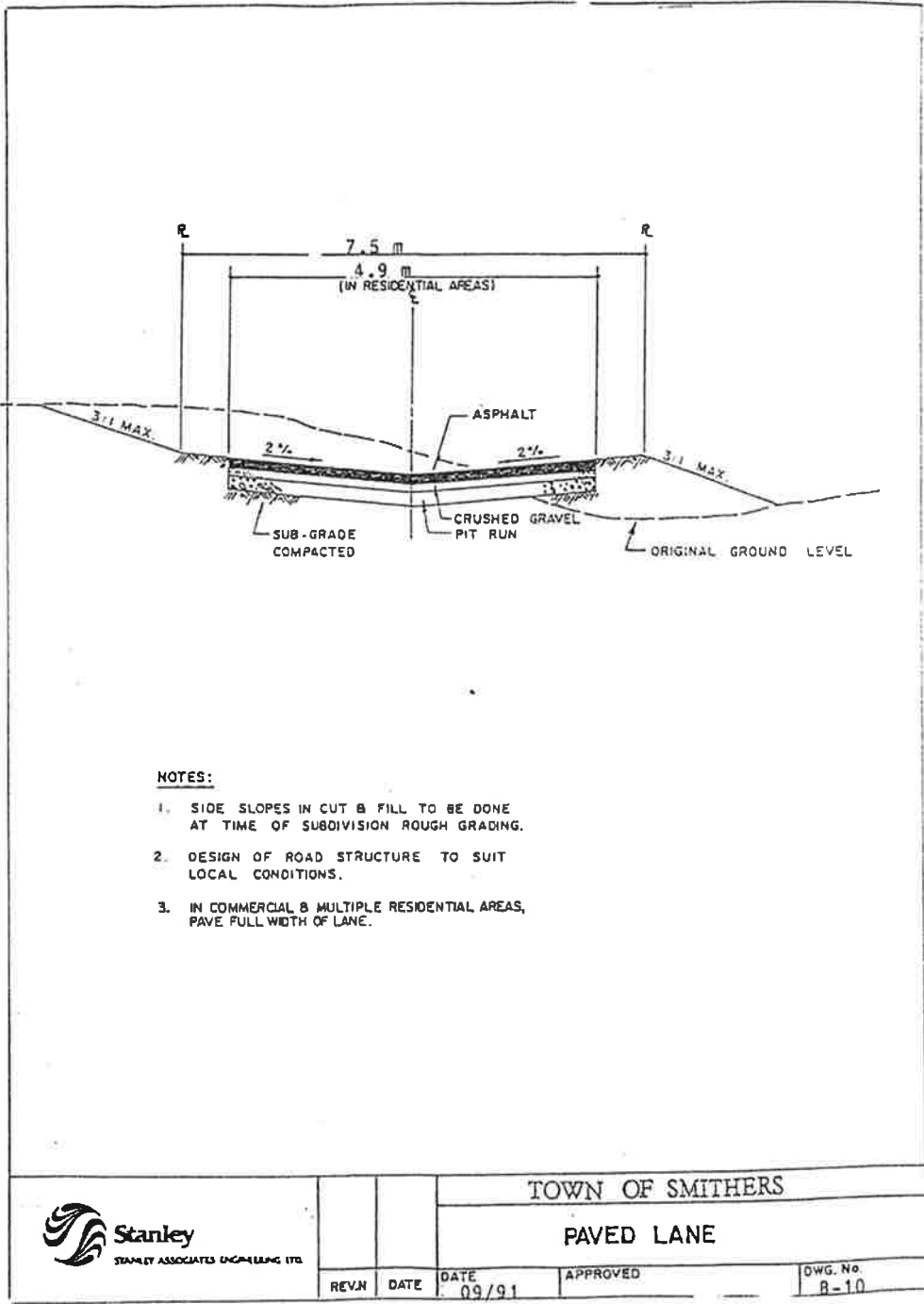
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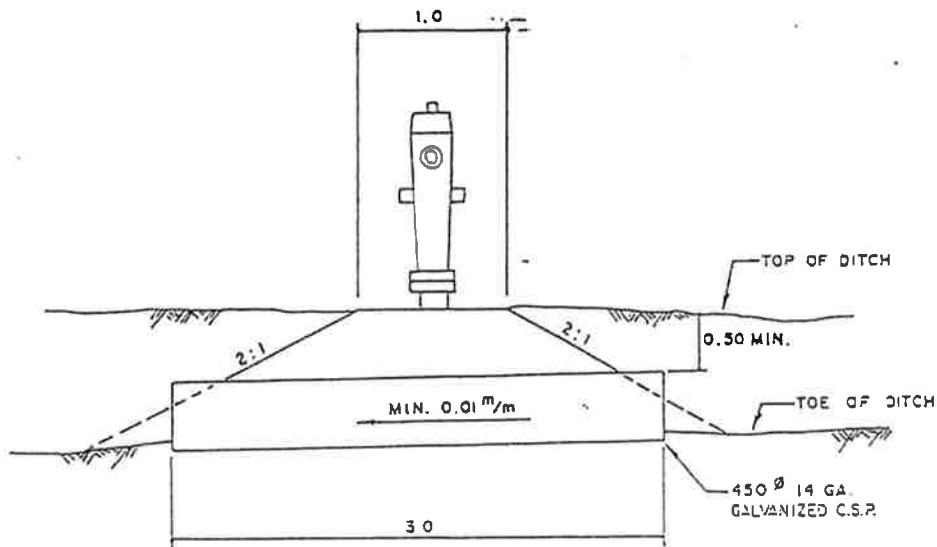
DRAWING B-09




DRAWING B-10



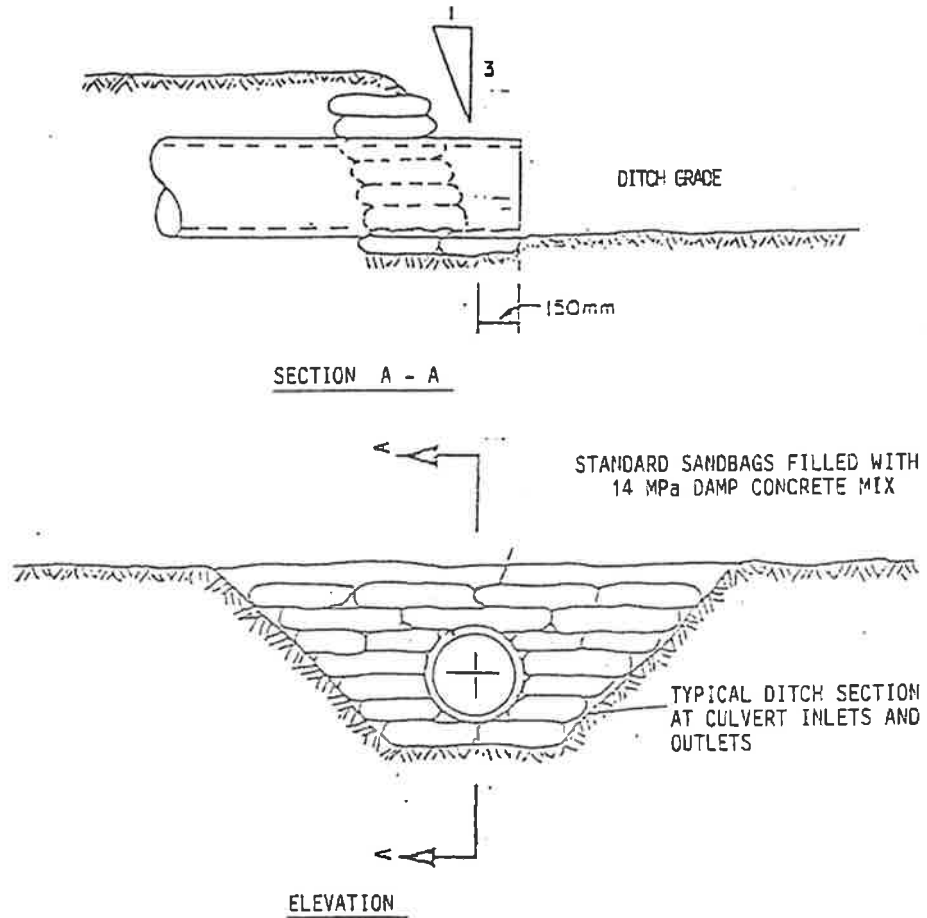
DRAWING B-11



ELEVATION

 Stanley <small>STANLEY ASSOCIATES ENGINEERING LTD.</small>		TOWN OF SMITHERS	
		HYDRANT ACCESS PATH (RURAL ROADS)	
REV. N	DATE	DATE	DWG. No.
		09/91	R-11

DRAWING B-12



NOTES: 1. 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

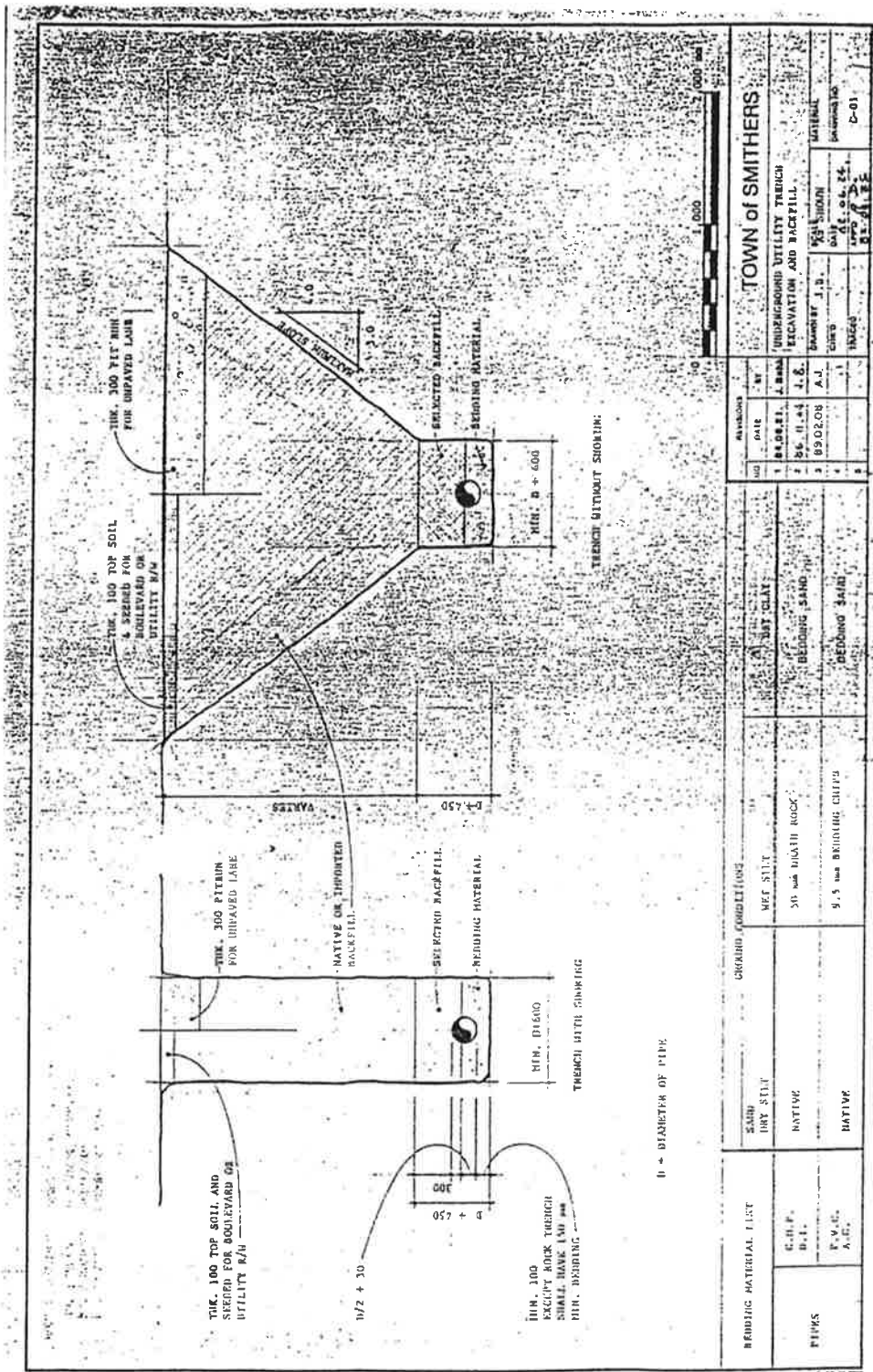
STANLEY ASSOCIATES ENGINEERING LTD

TOWN OF SMITHERS

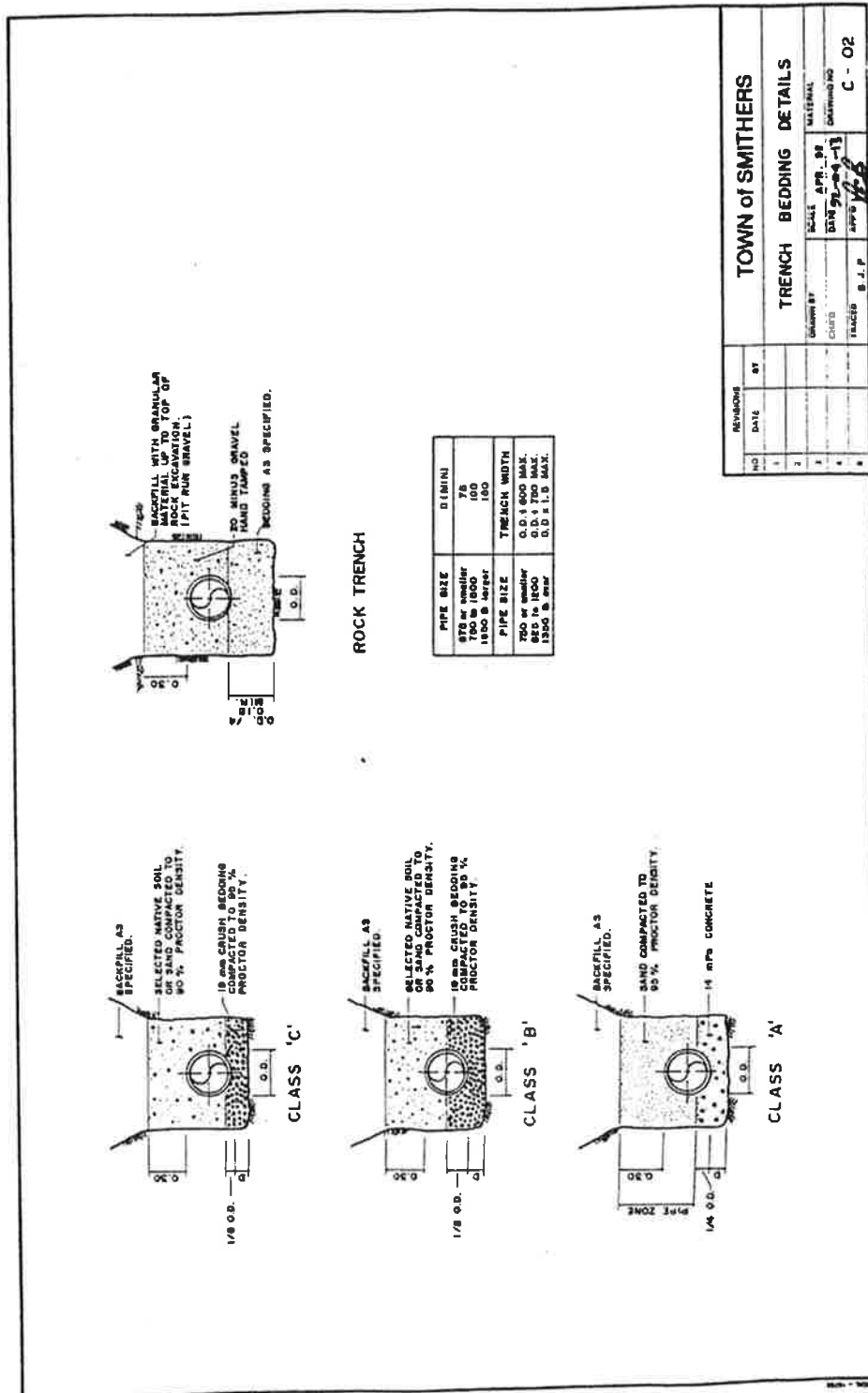
SANDBAG BULKHEADS

DWG NO.

DRAWING C-01



DRAWING C-02



DRAWING C-03



Diagram illustrating the construction of a trench for a 21 MPa concrete slab. The diagram shows a cross-section of a trench with a concrete slab on top. The trench is filled with bedding material, and the concrete slab is placed on top. The diagram includes labels for 'UNDISTURBED TRENCH BOTTOM', 'BEDDING MATERIAL', '21 MPa CONCRETE', '100mm Ø DRAIN TILE (2 REQUIRED)', and 'PLACE APPROX. 20 kg OF SUITABLE CLEAR CRUSHED GRAVEL AT EACH OPENING'. A dimension of '300 MIN' is indicated for the width of the concrete slab.

LONGITUDINAL SECTION



TRENCH ANCHOR BLOCKS

REV. N

DATE _____

DATE _____

09/91

APPROVED

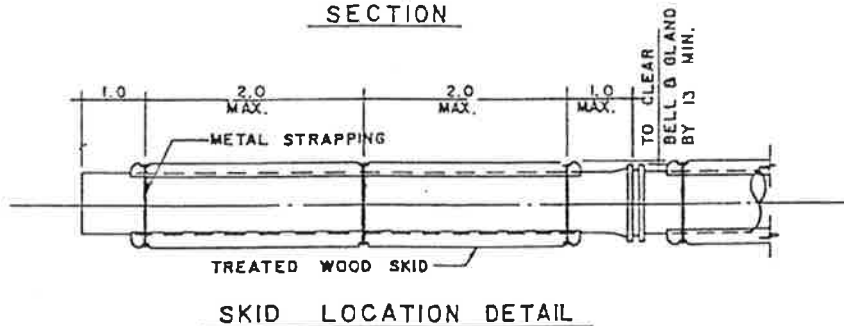
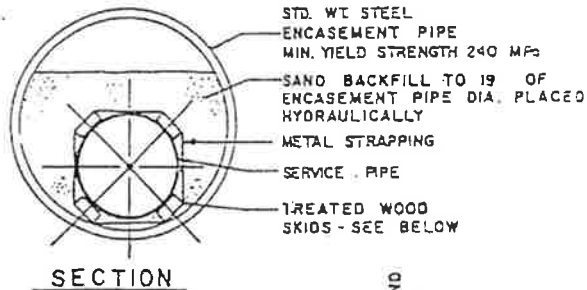
DWG. No.
C-03

DRAWING C-04

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 DIA. IN mm	CASING SIZE 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

86



TOWN OF SMITHERS
ENCASEMENT PIPE DETAIL

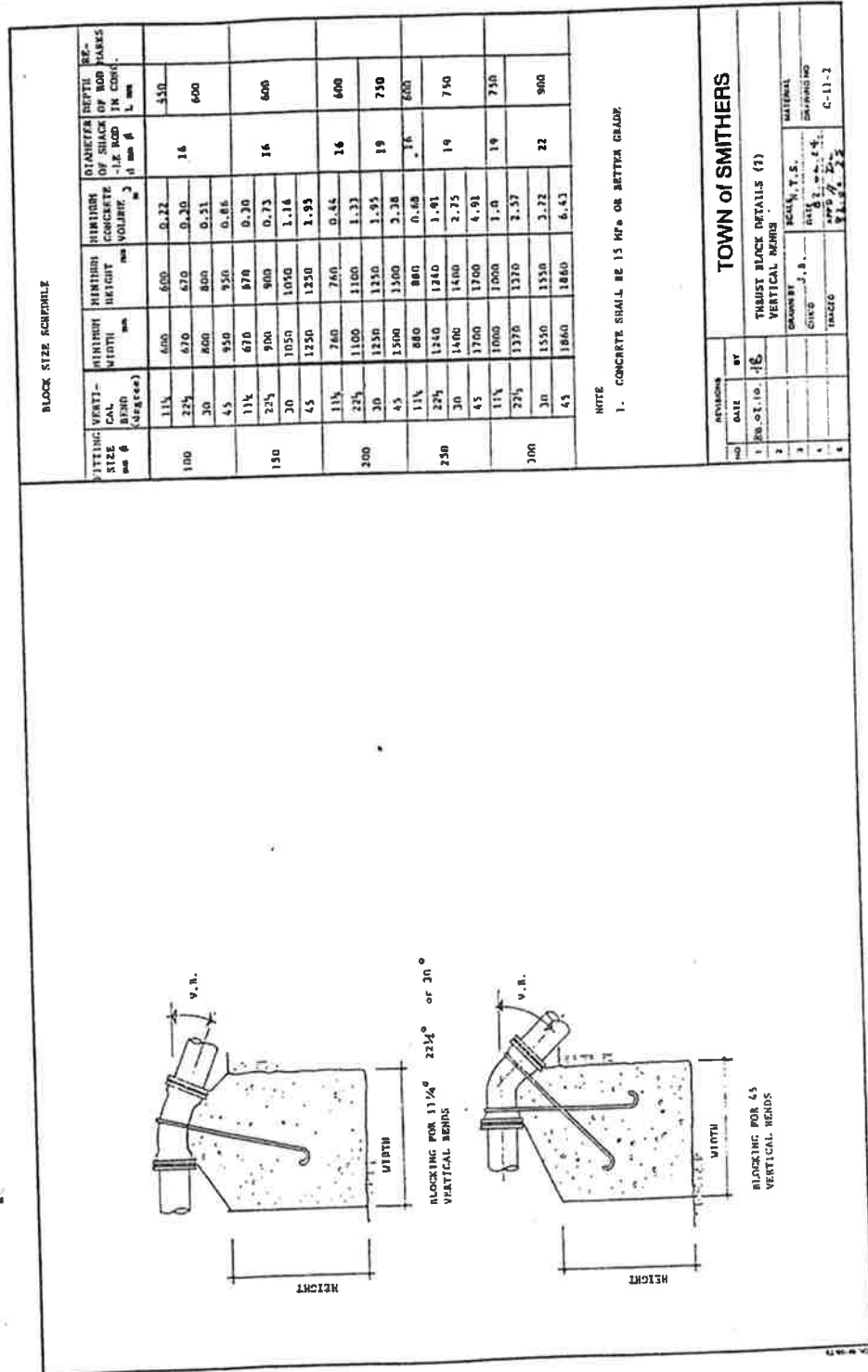
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DRAWING C-11-01

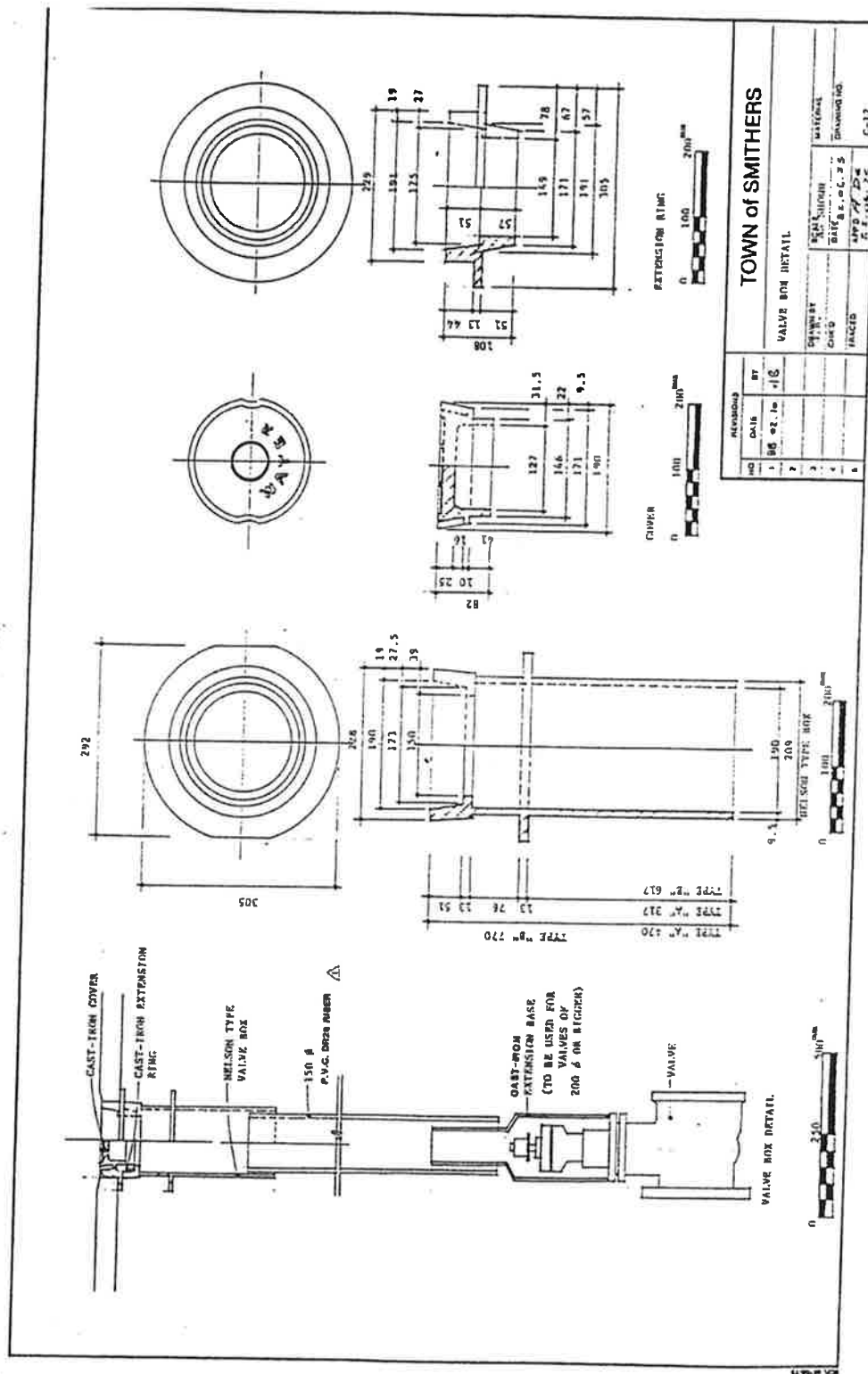


TOWN OF SMITHERS
SCHEDULE "A" TO BYLAW NO. 1800
 Page A-90

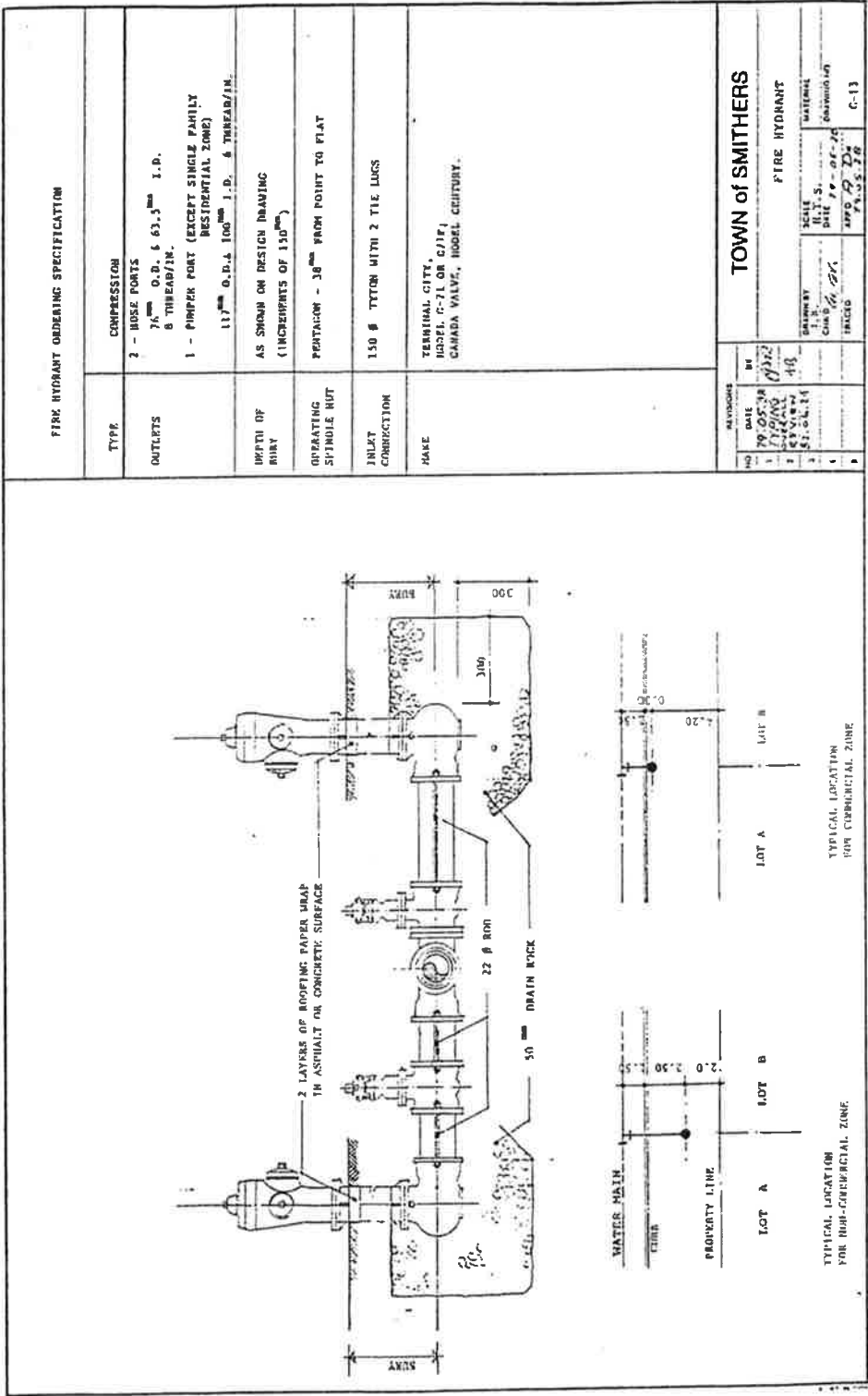
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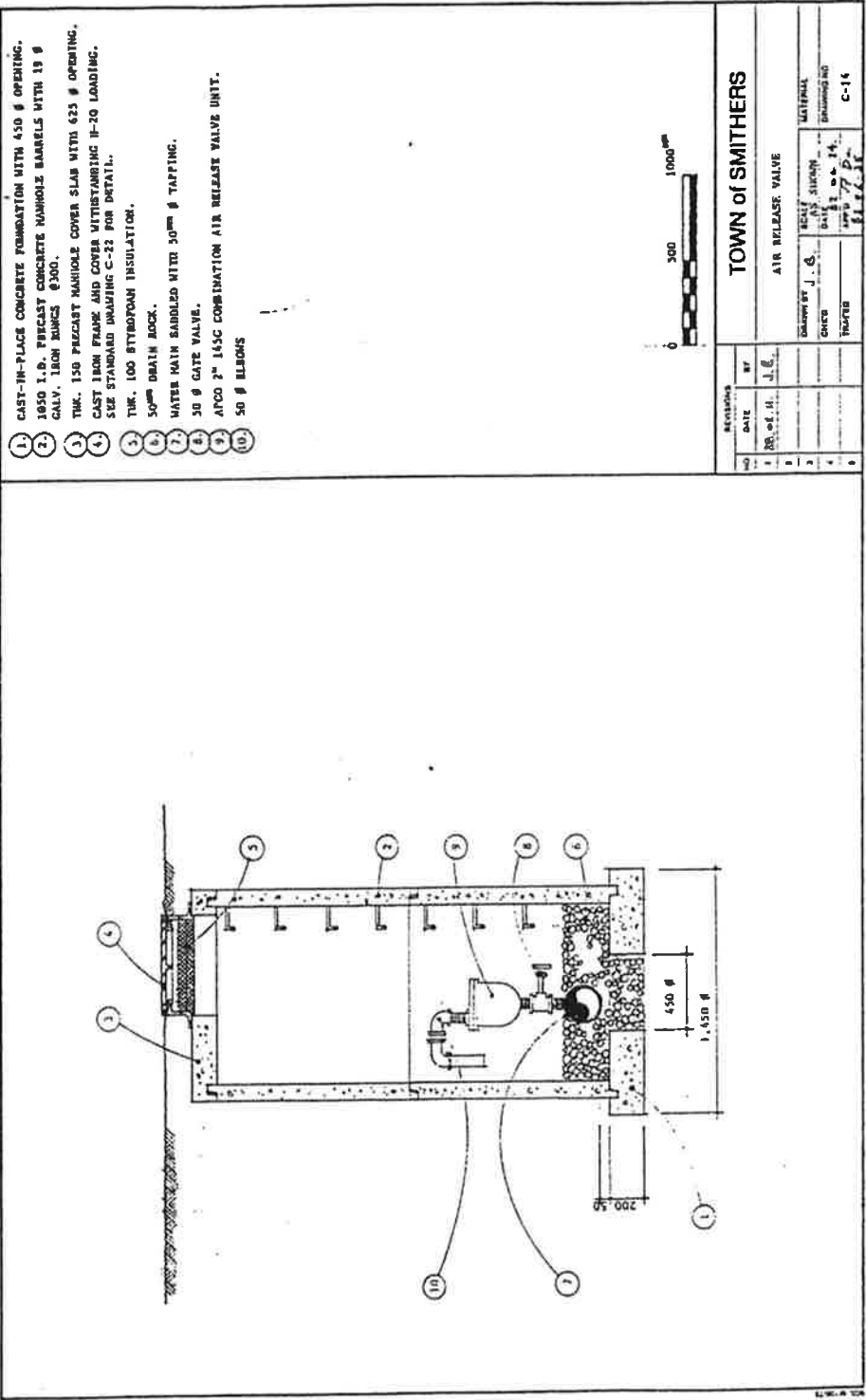
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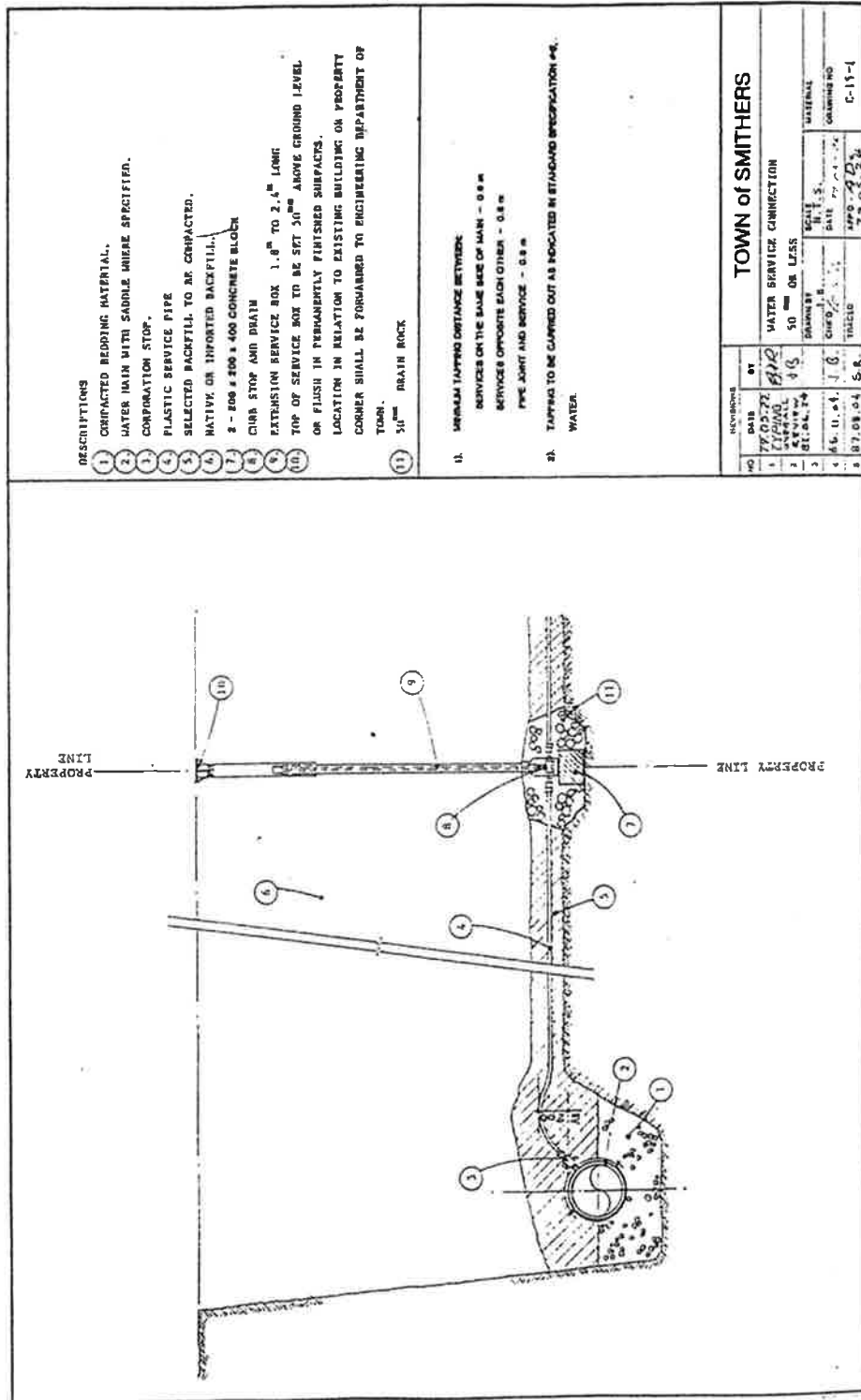
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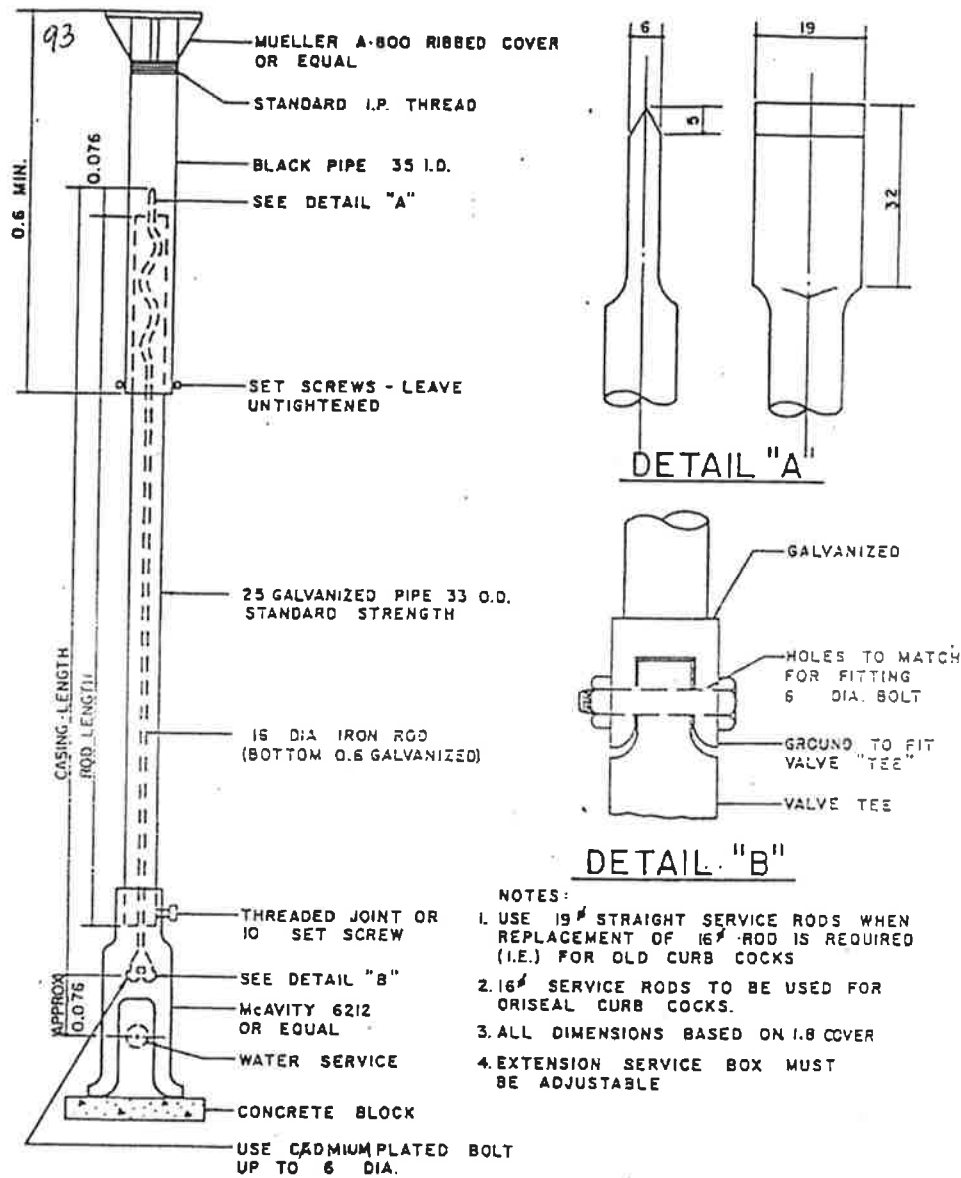
DRAWING C-14



DRAWING C-15-01



DRAWING C-15-02

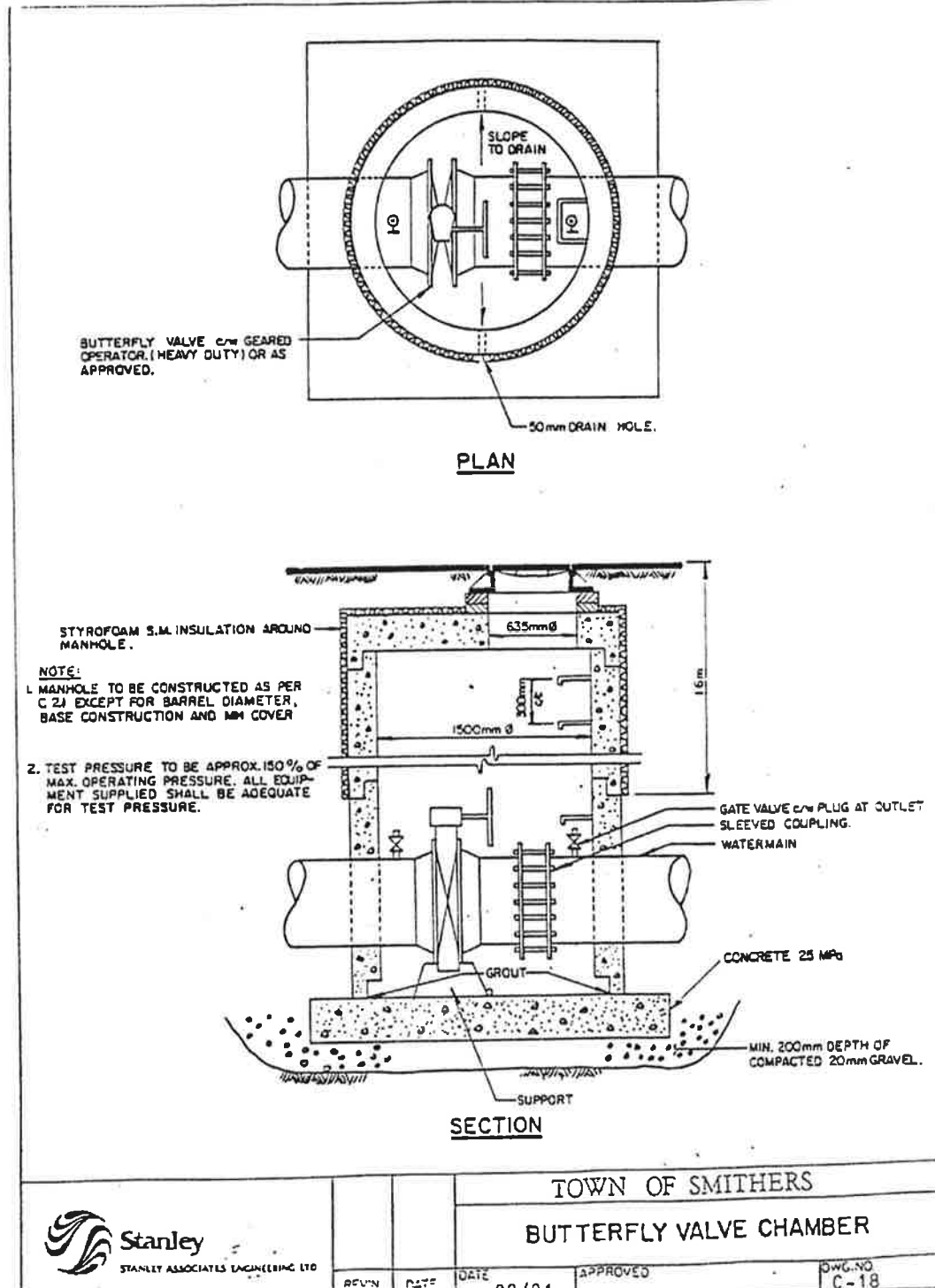


TOWN OF SMITHERS

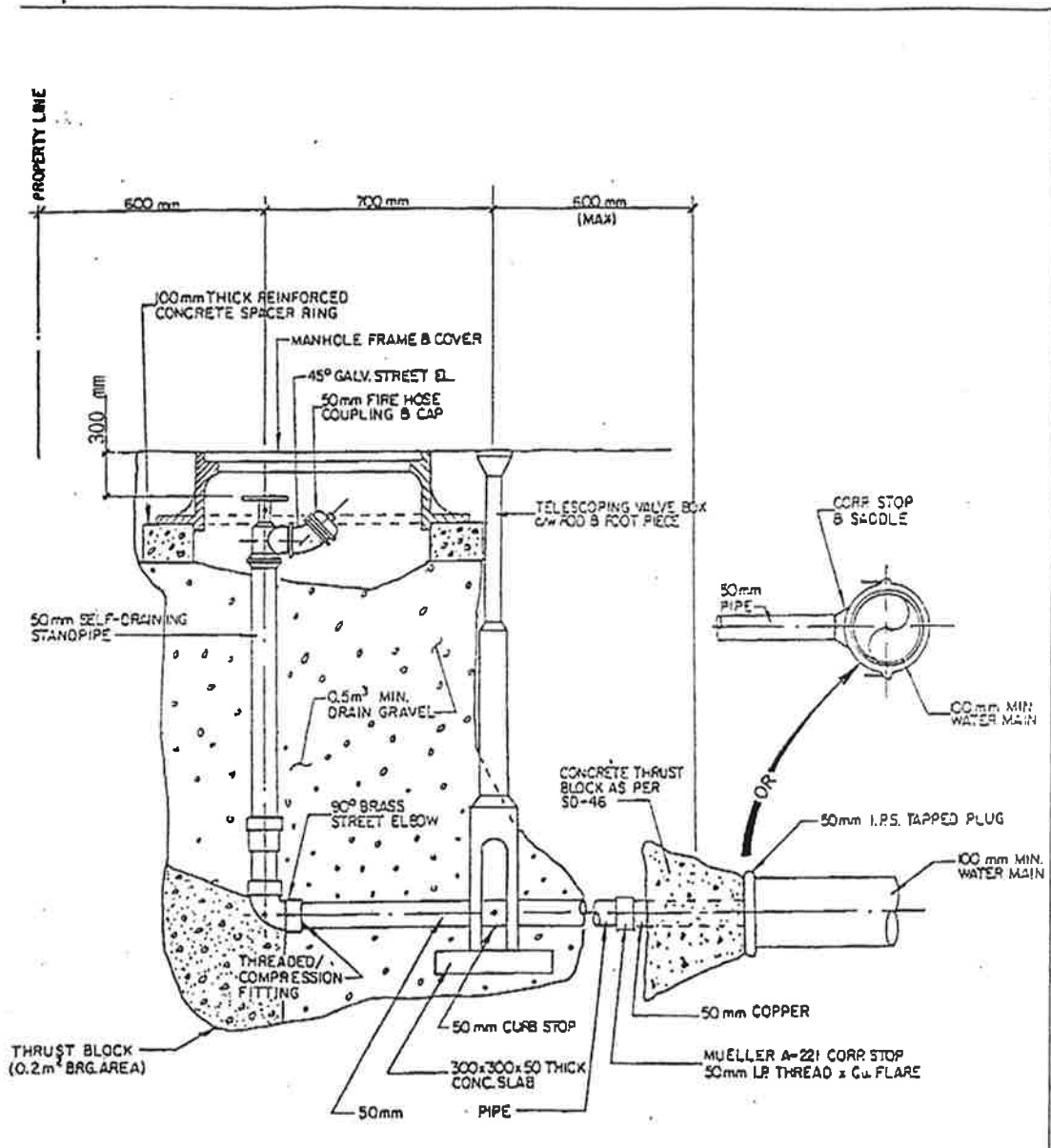
EXTENSION SERVICE BOX DETAIL

REV. N	DATE	DATE 09/91	APPROVED	DWG. No. C-15-2
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DRAWING C-18



DRAWING C-19

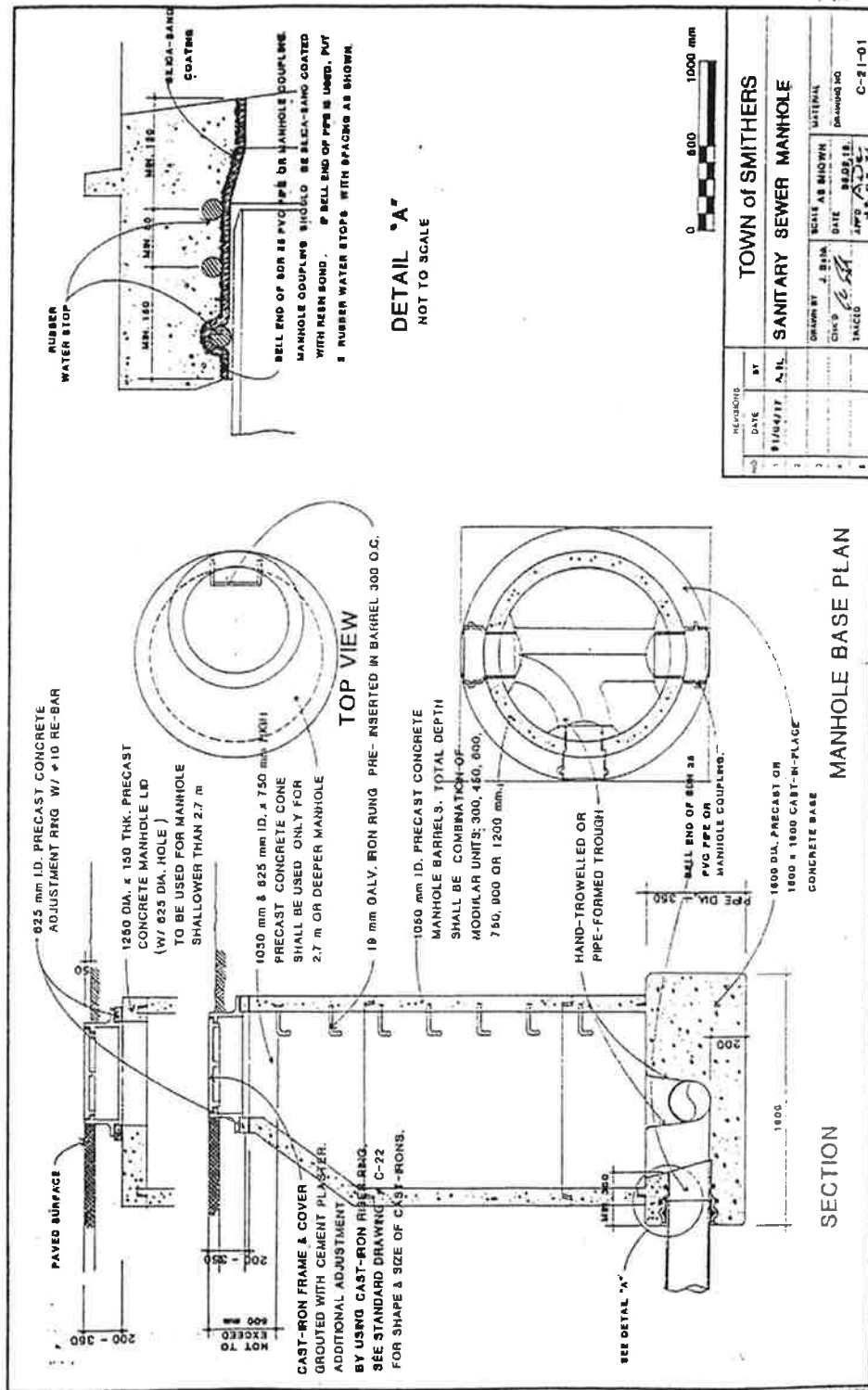


TOWN OF SMITHERS

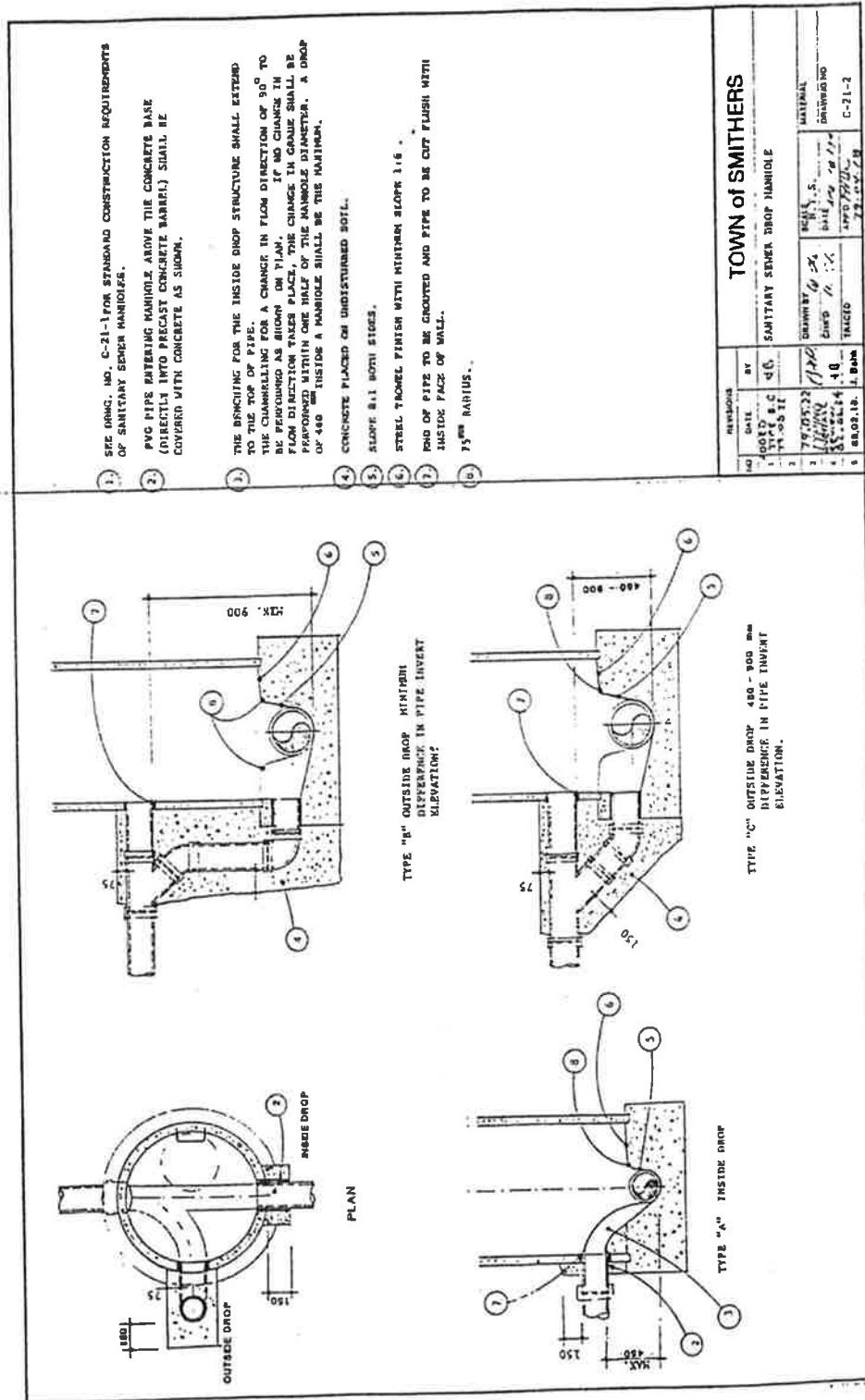
STANDPIPE DETAILS

REV. N	DATE	DATE	APPROVED	DWN ^g
		09/91		C-19

DRAWING C-21-01

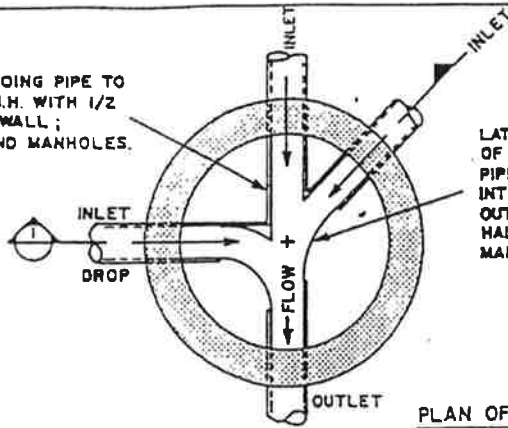


DRAWING C-21-2



DRAWING C-21-03

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

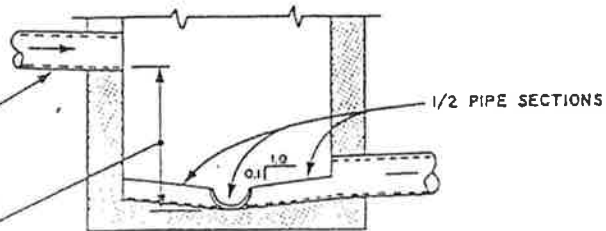


LATERALS WITH AN INTERSECTION OF 90° OR LESS TO THE INLET PIPE ARE TO GO STRAIGHT TO THE INTERSECTION WITH THE OUTGOING PIPE WITH A HALF PIPE SET IN MAIN BENCHING.

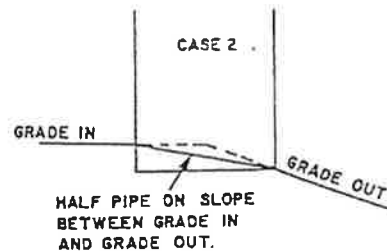
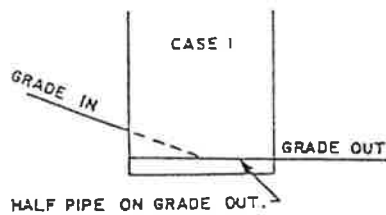
PLAN OF MANHOLE

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



TOWN OF SMITHERS

SANITARY MANHOLE BENCHING

REV, N

DATE

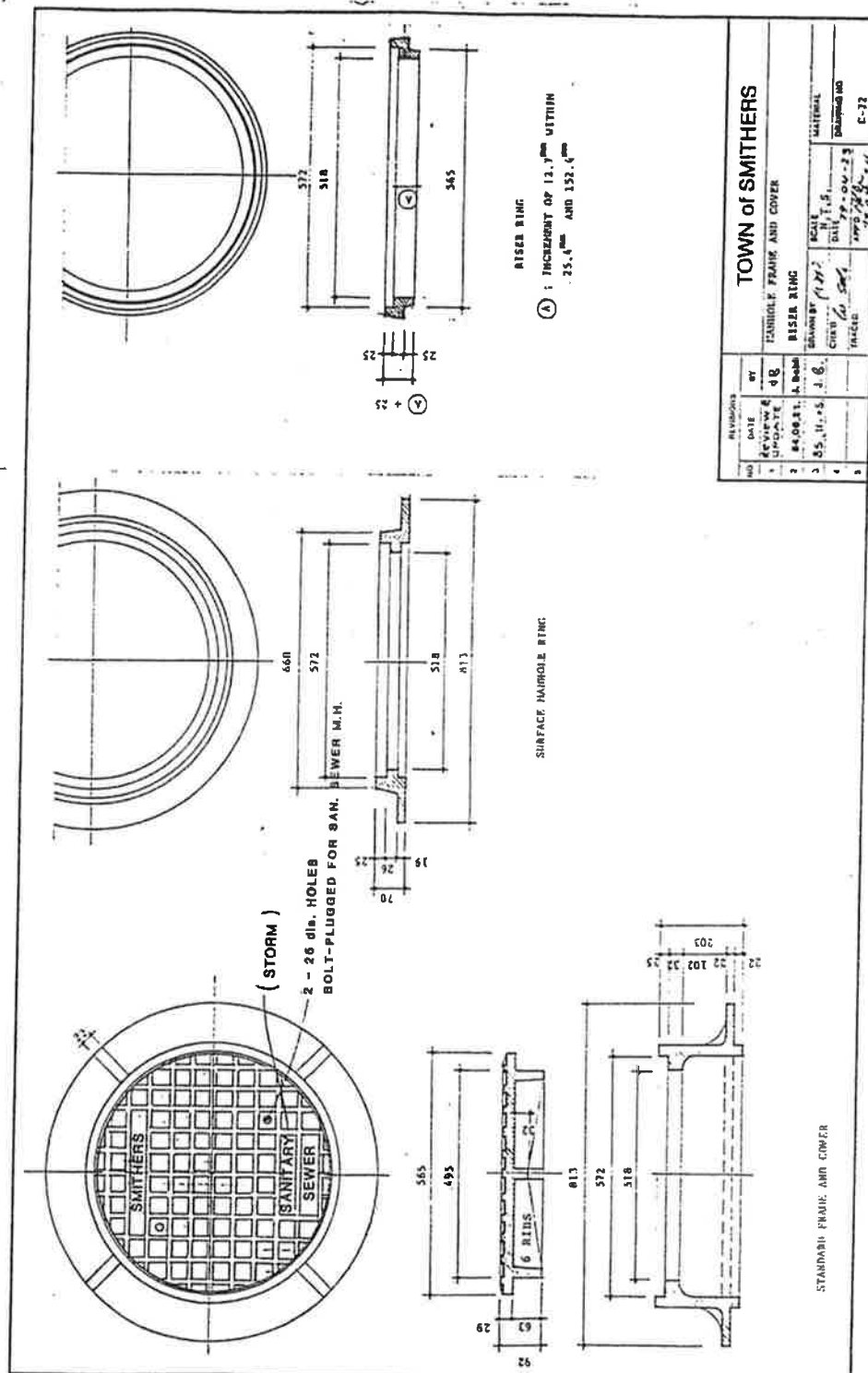
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09/91

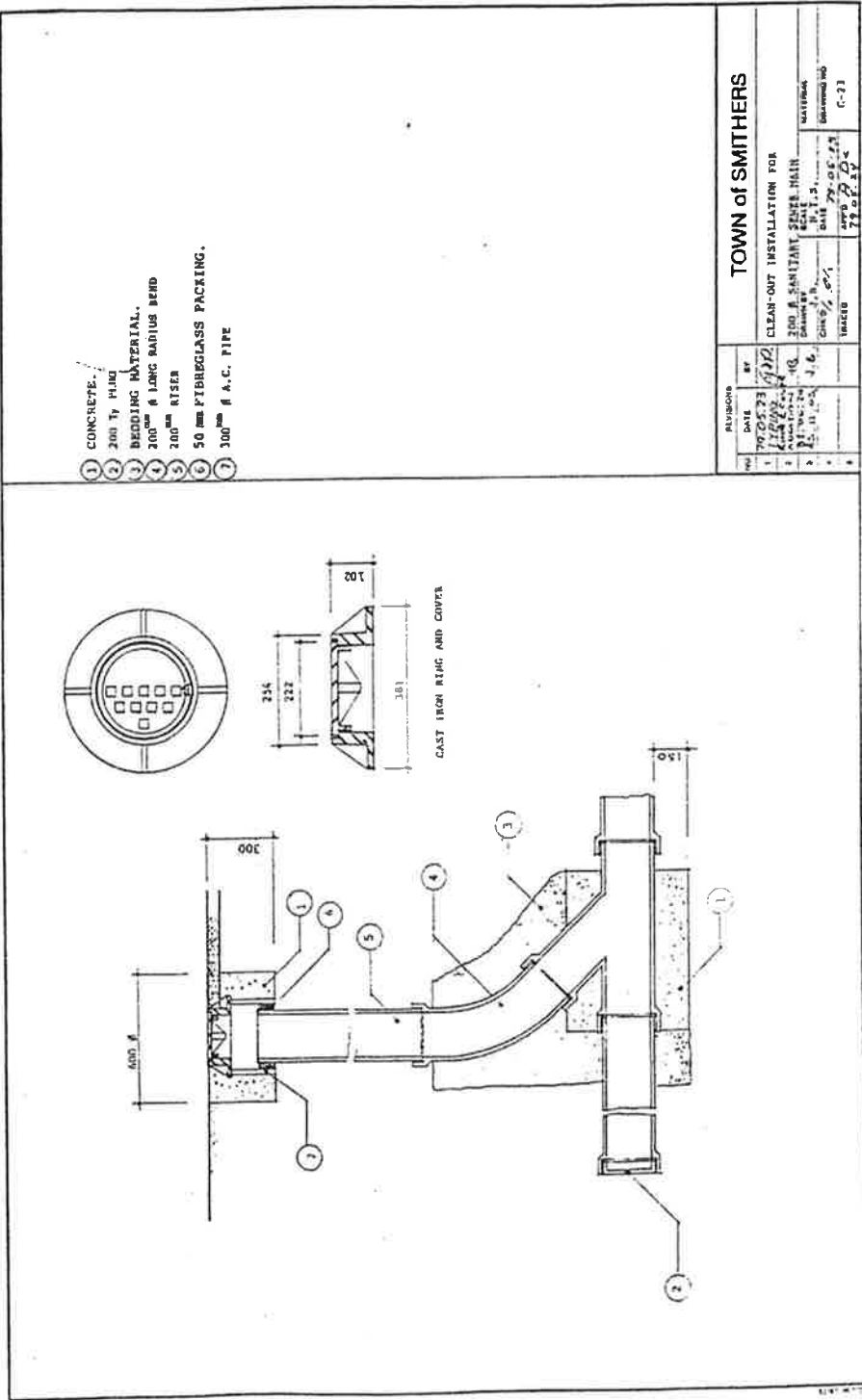
APPROVED

DWG No.
 C-21-3

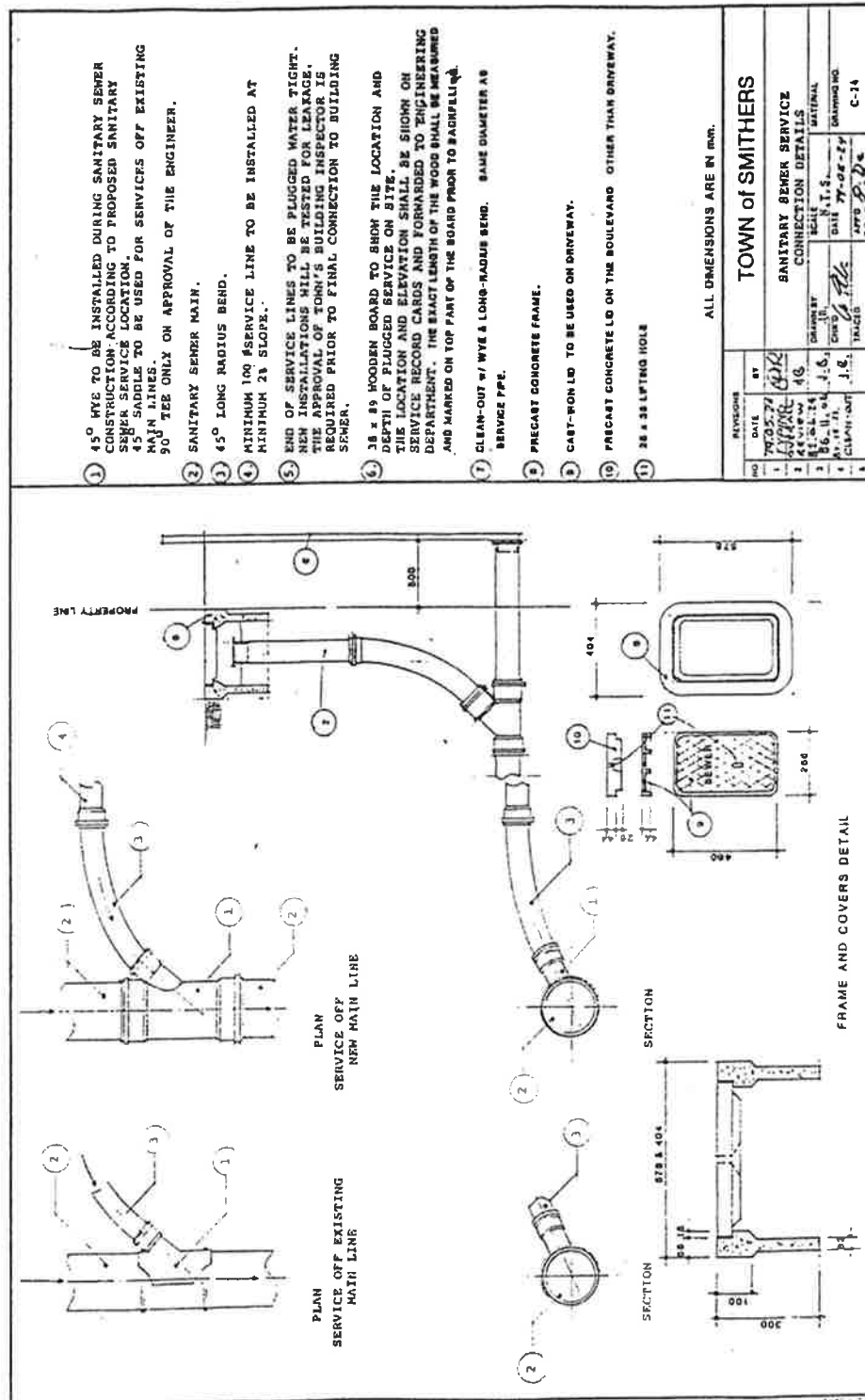
DRAWING C-22



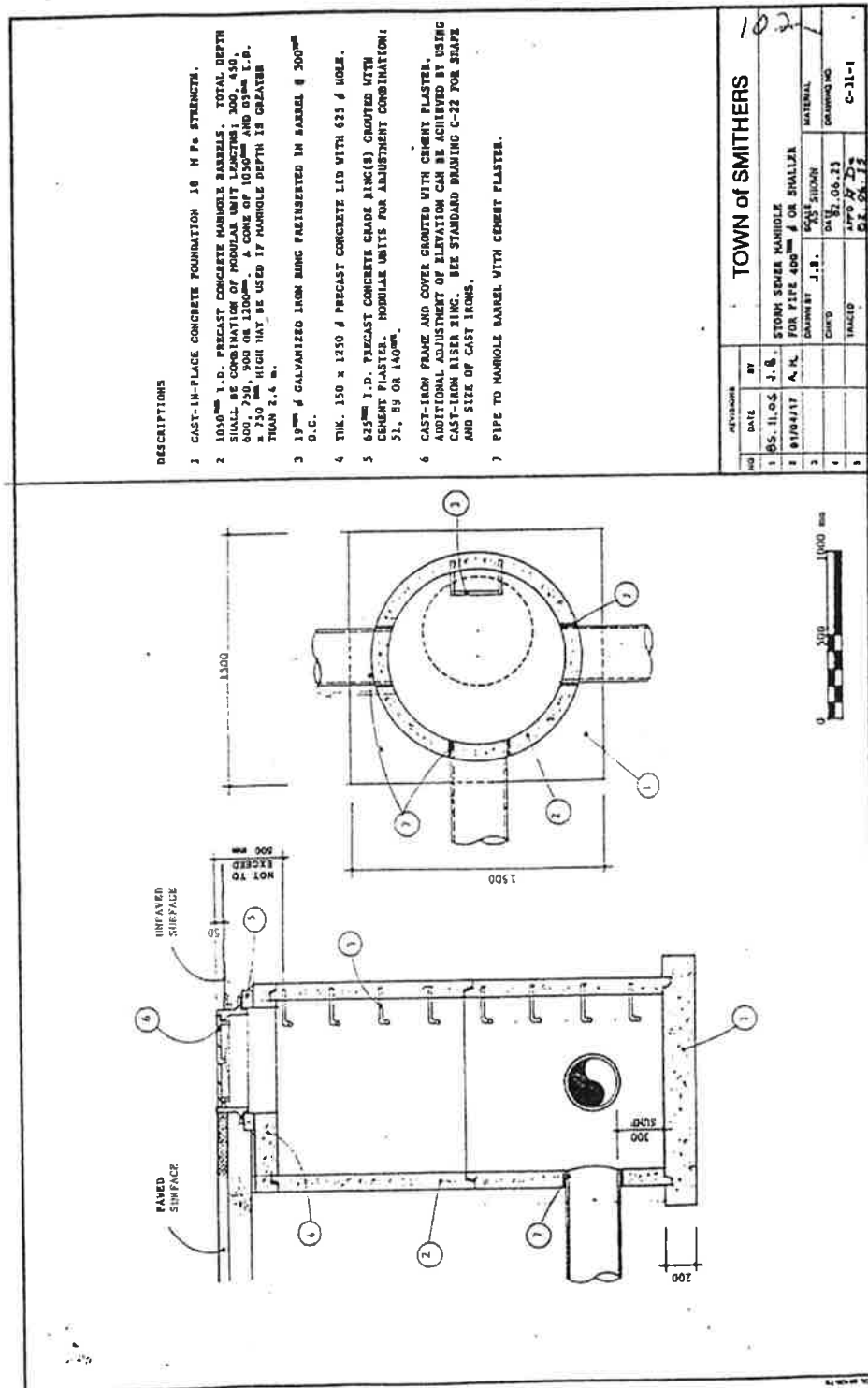
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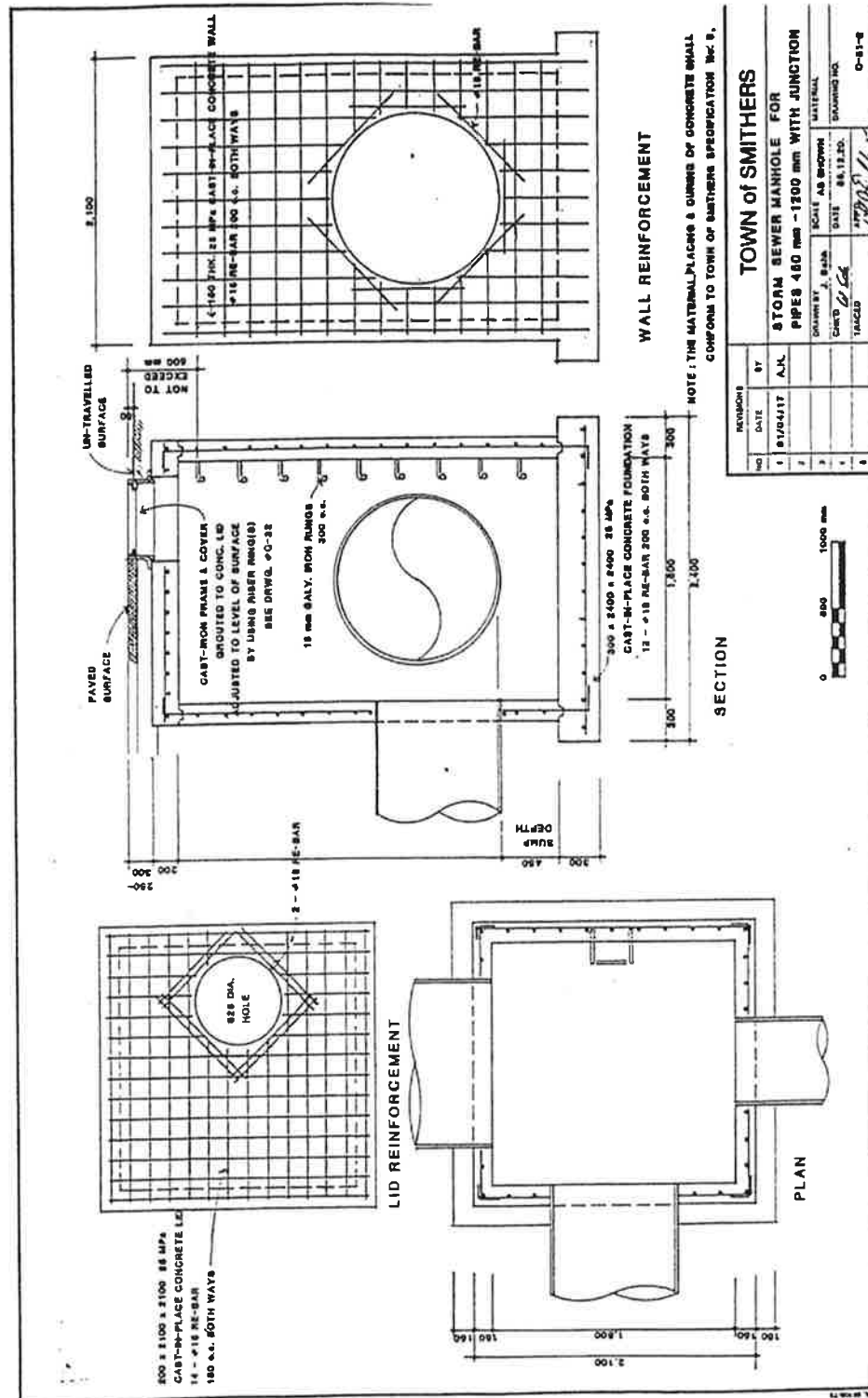
DRAWING C-24



DRAWING C-31-1

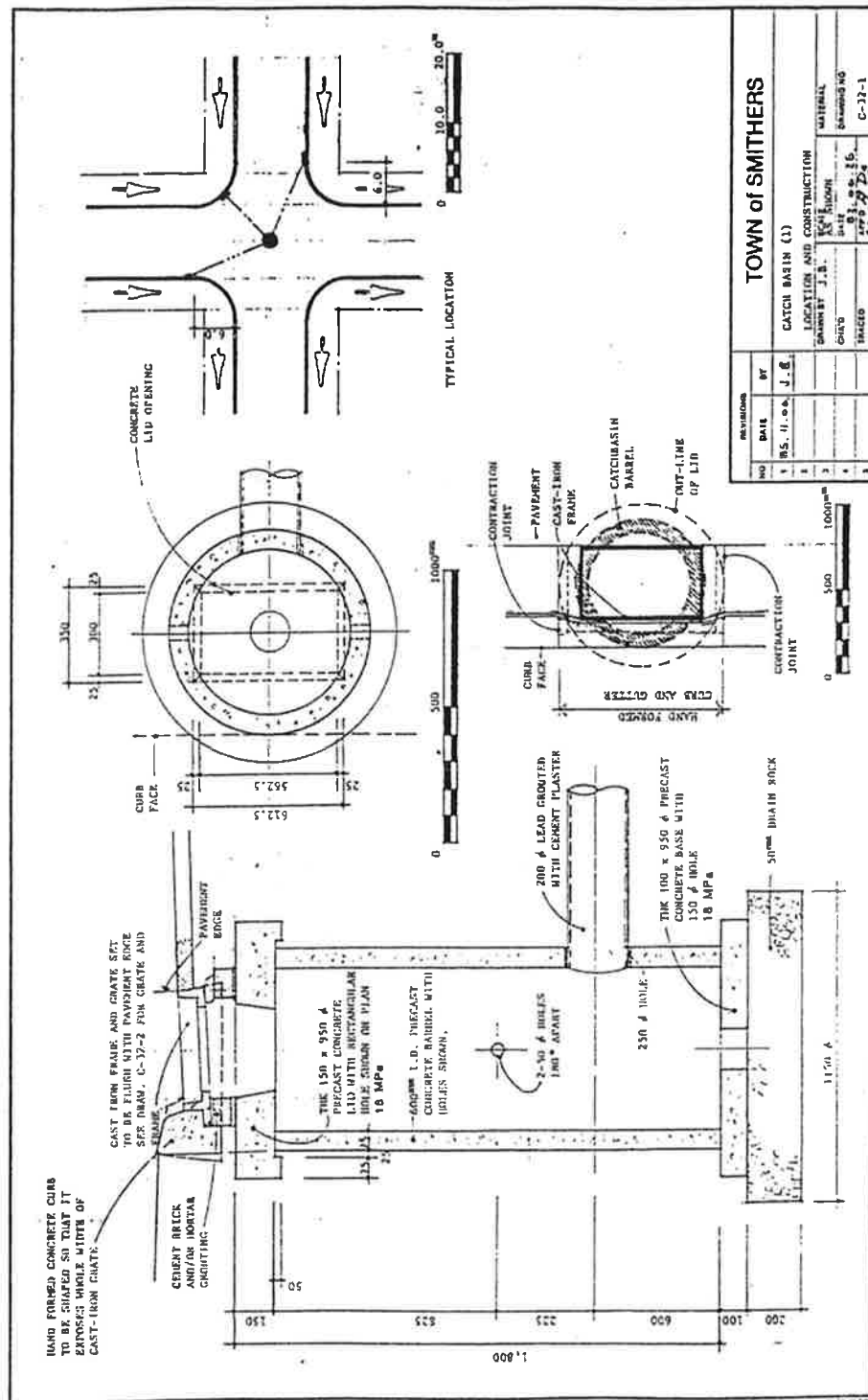


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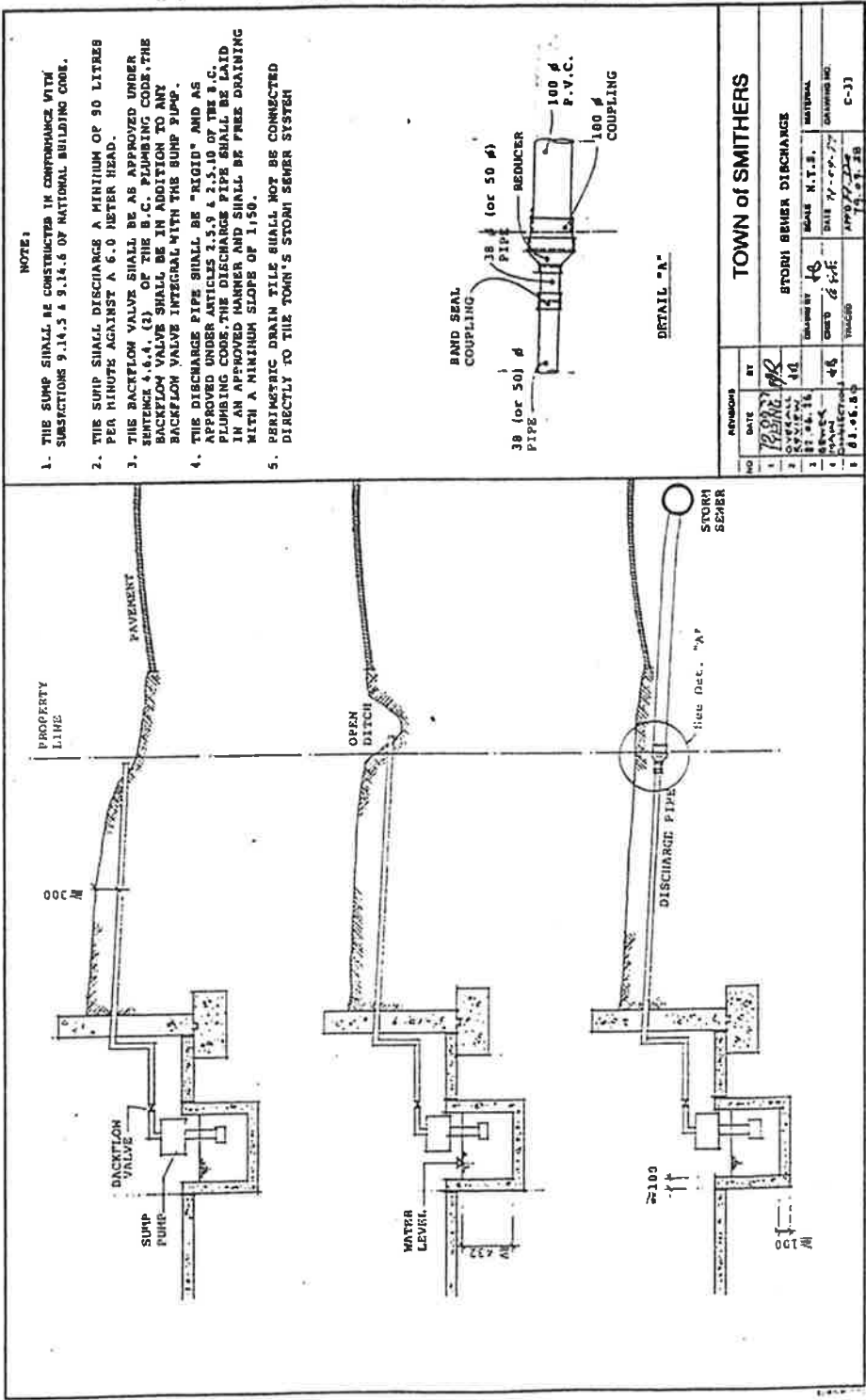
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DRAWING C-32-1

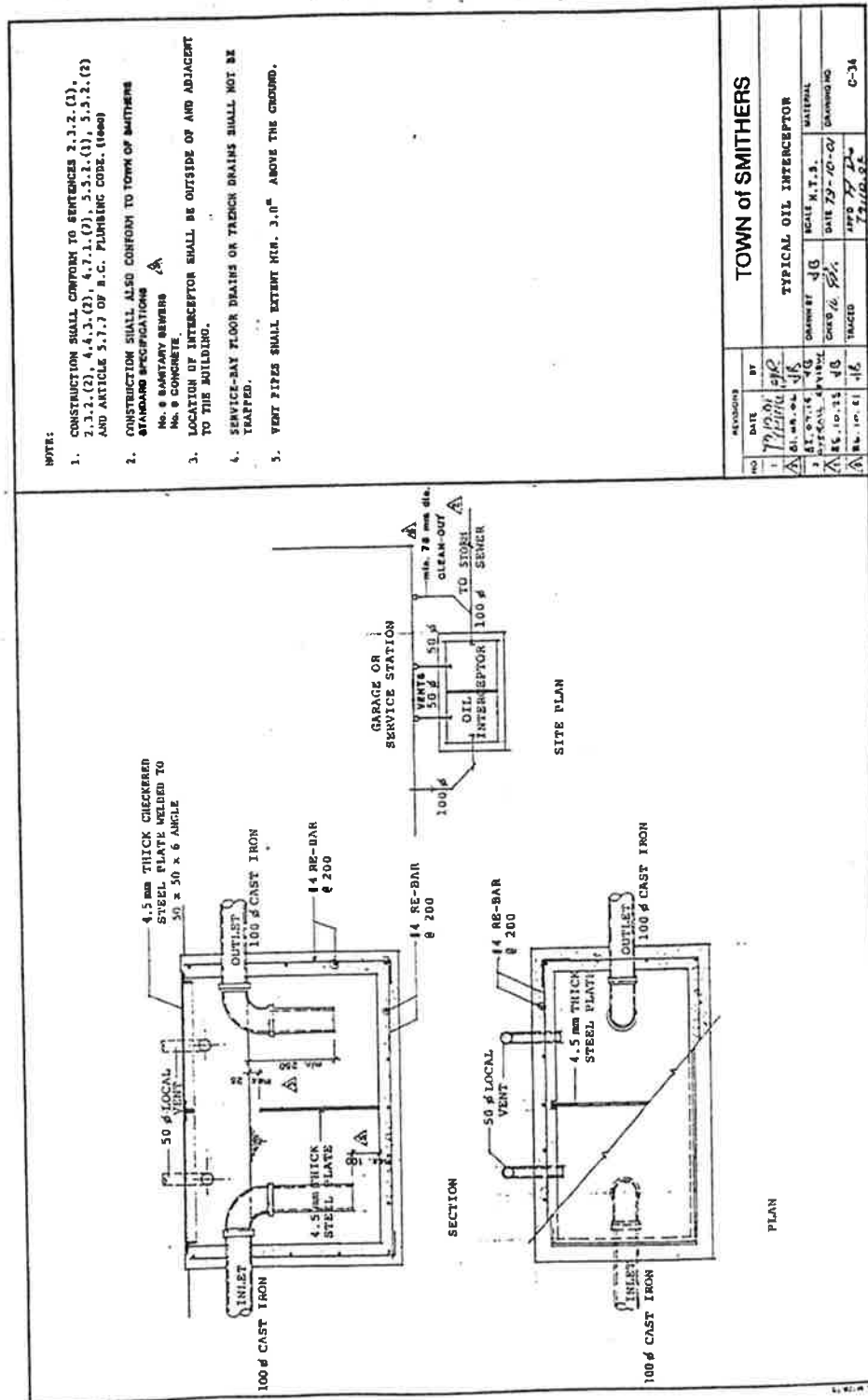


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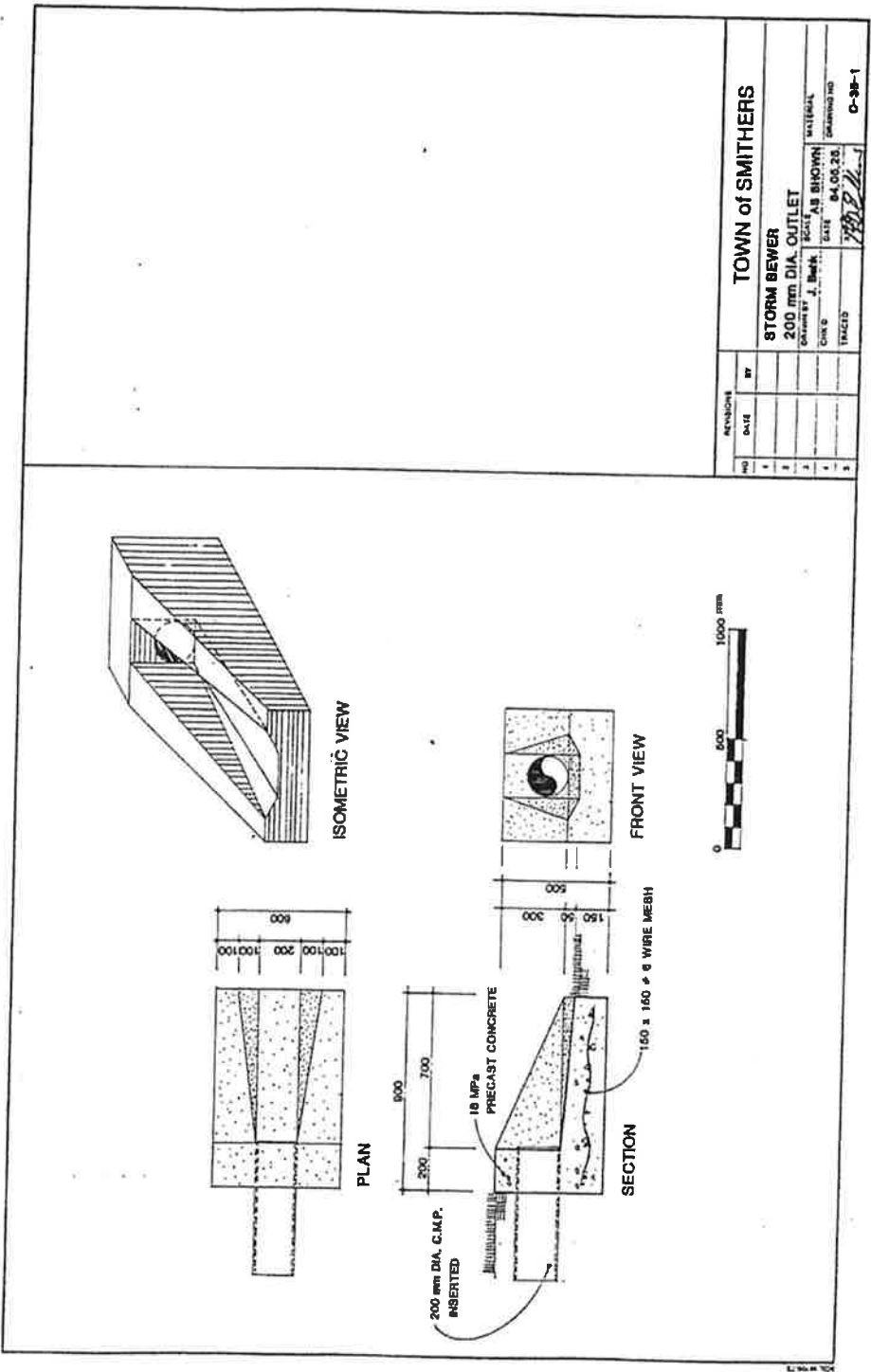
DRAWING C-33



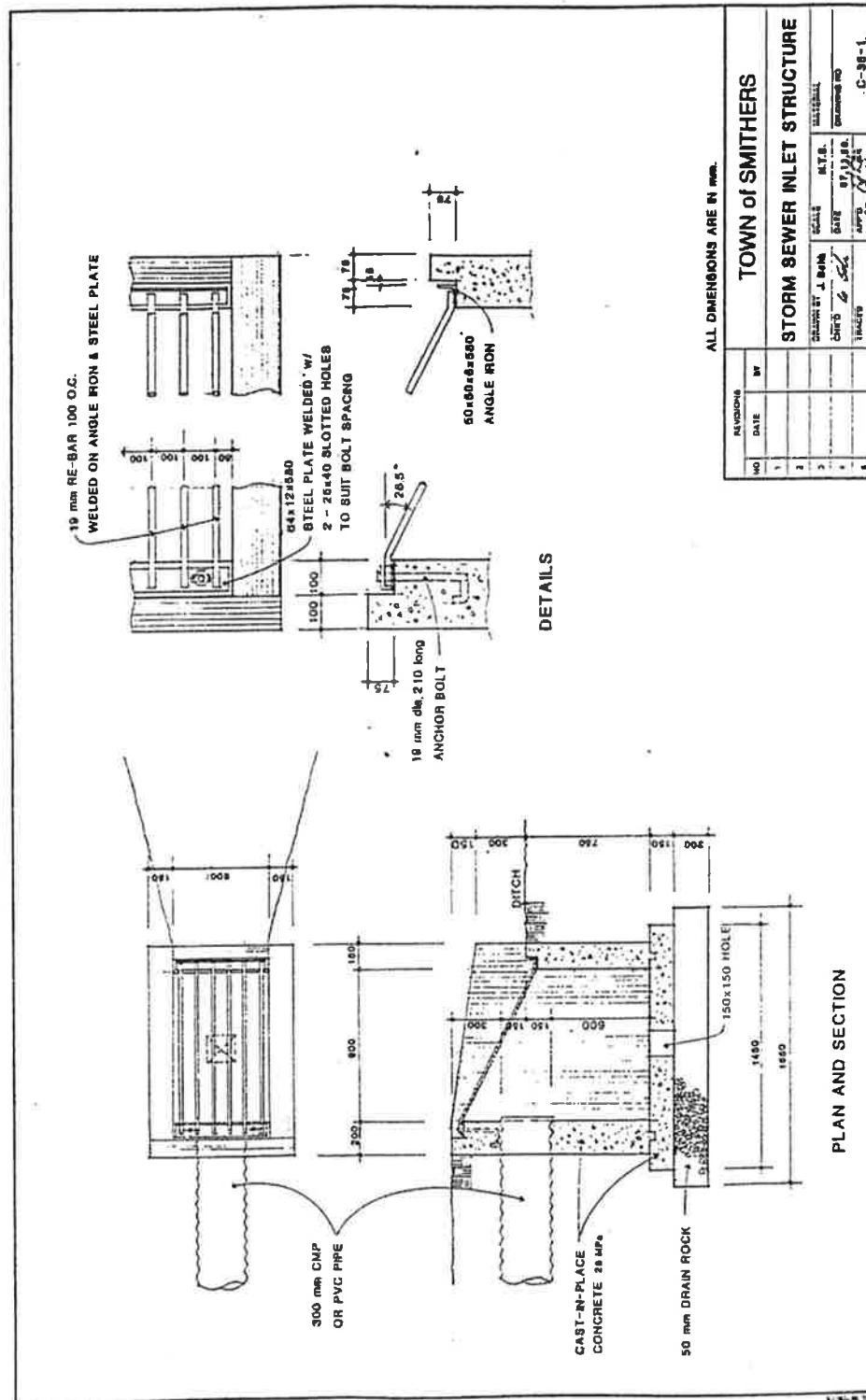
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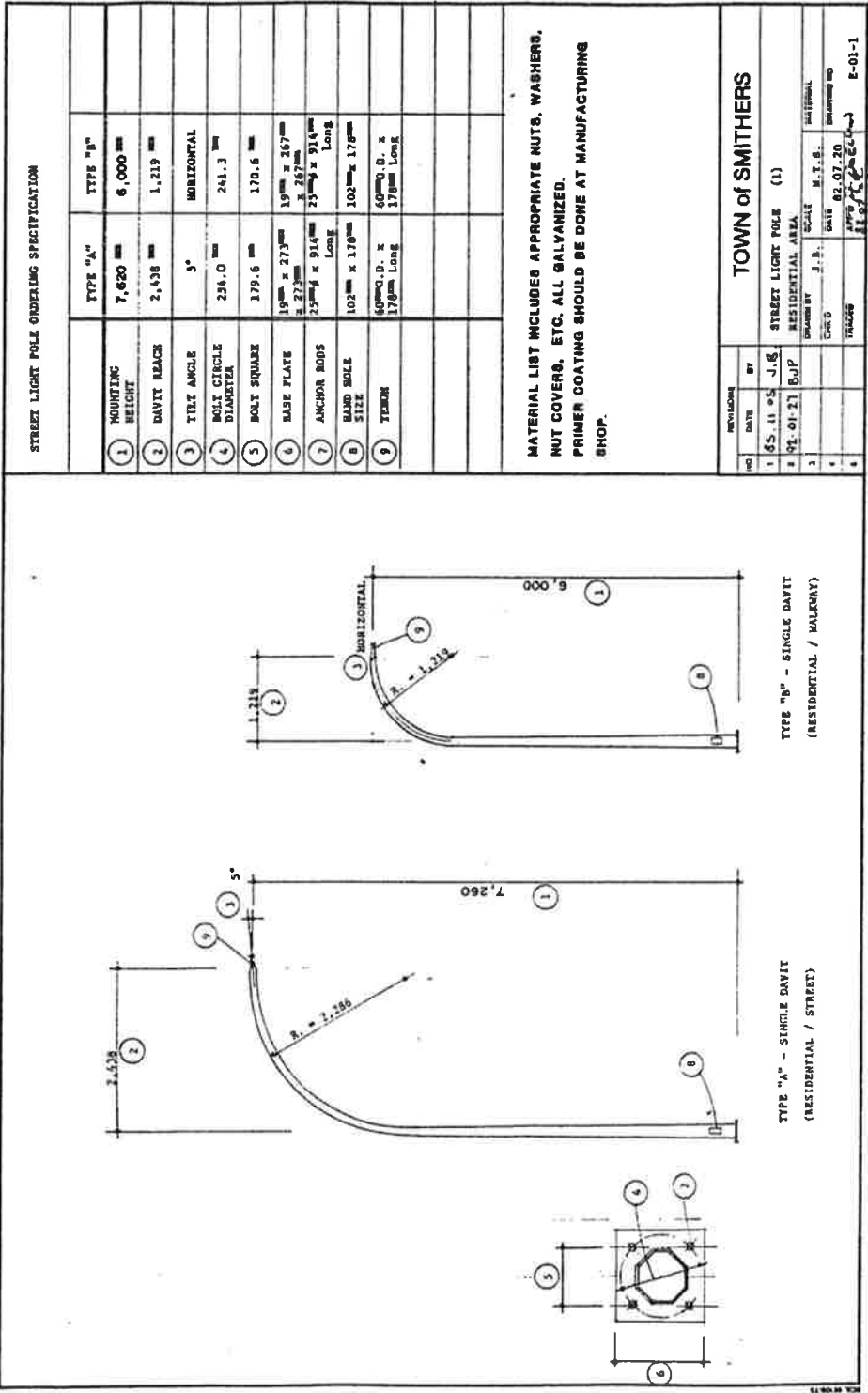
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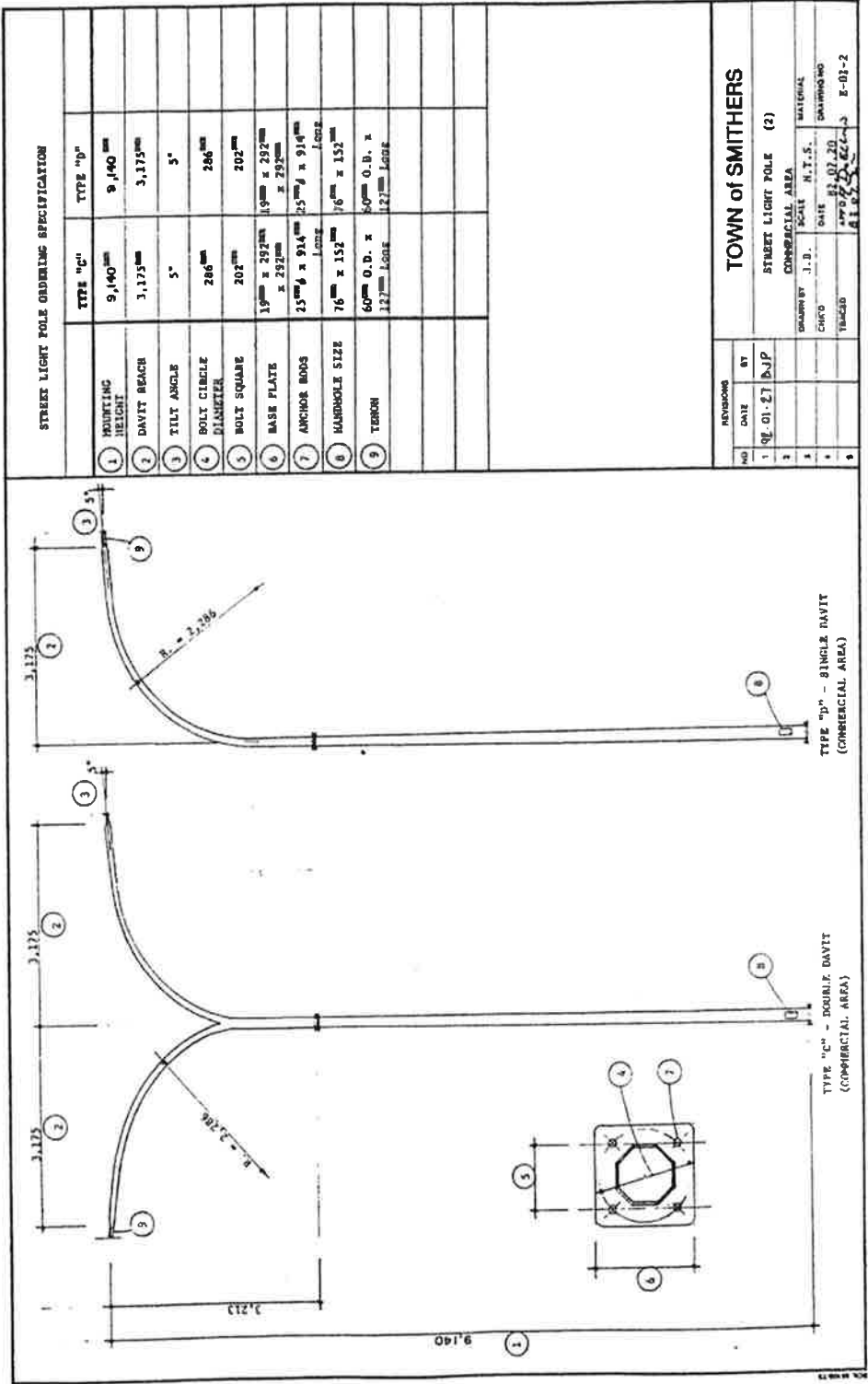
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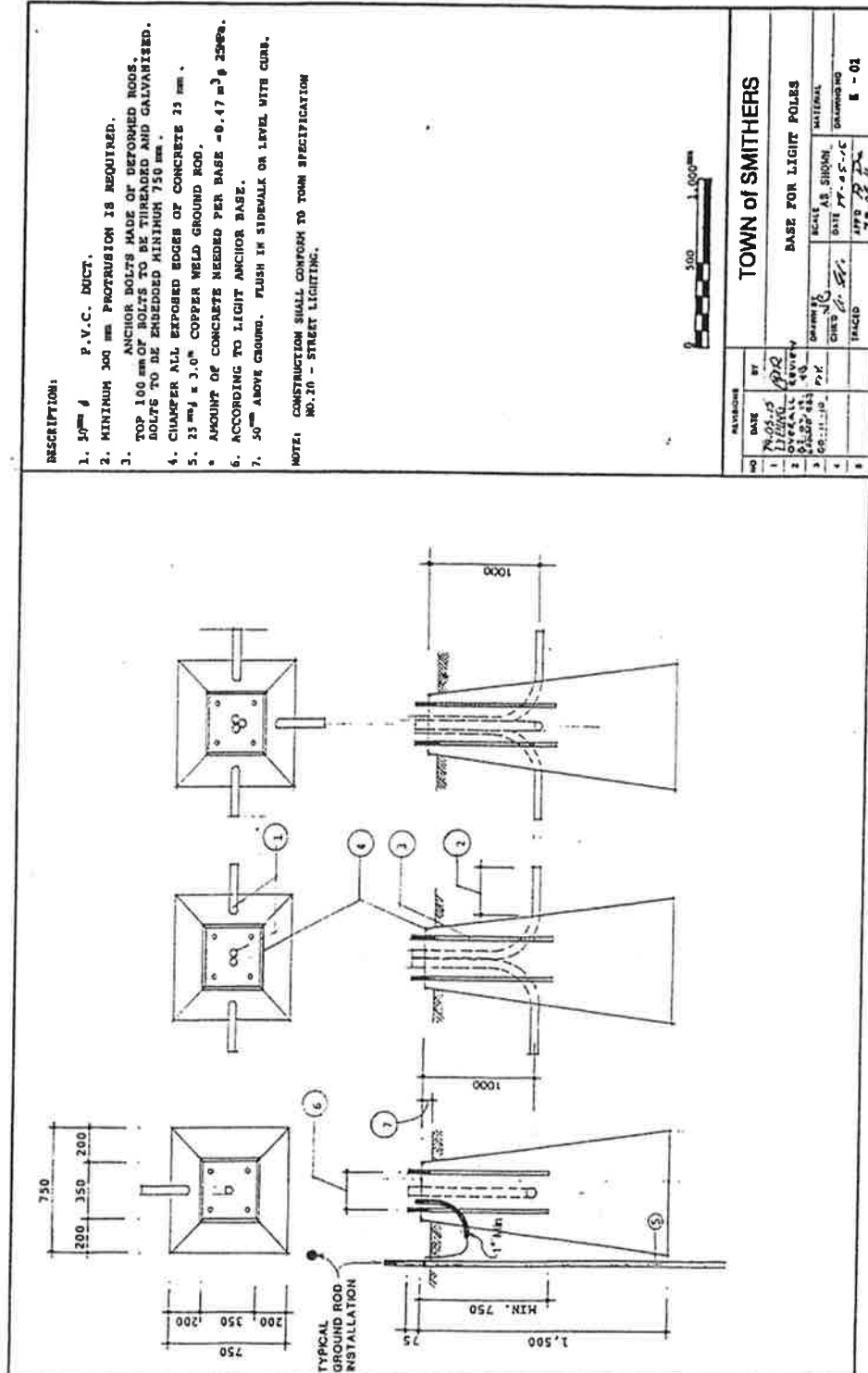
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DRAWING E-01-2



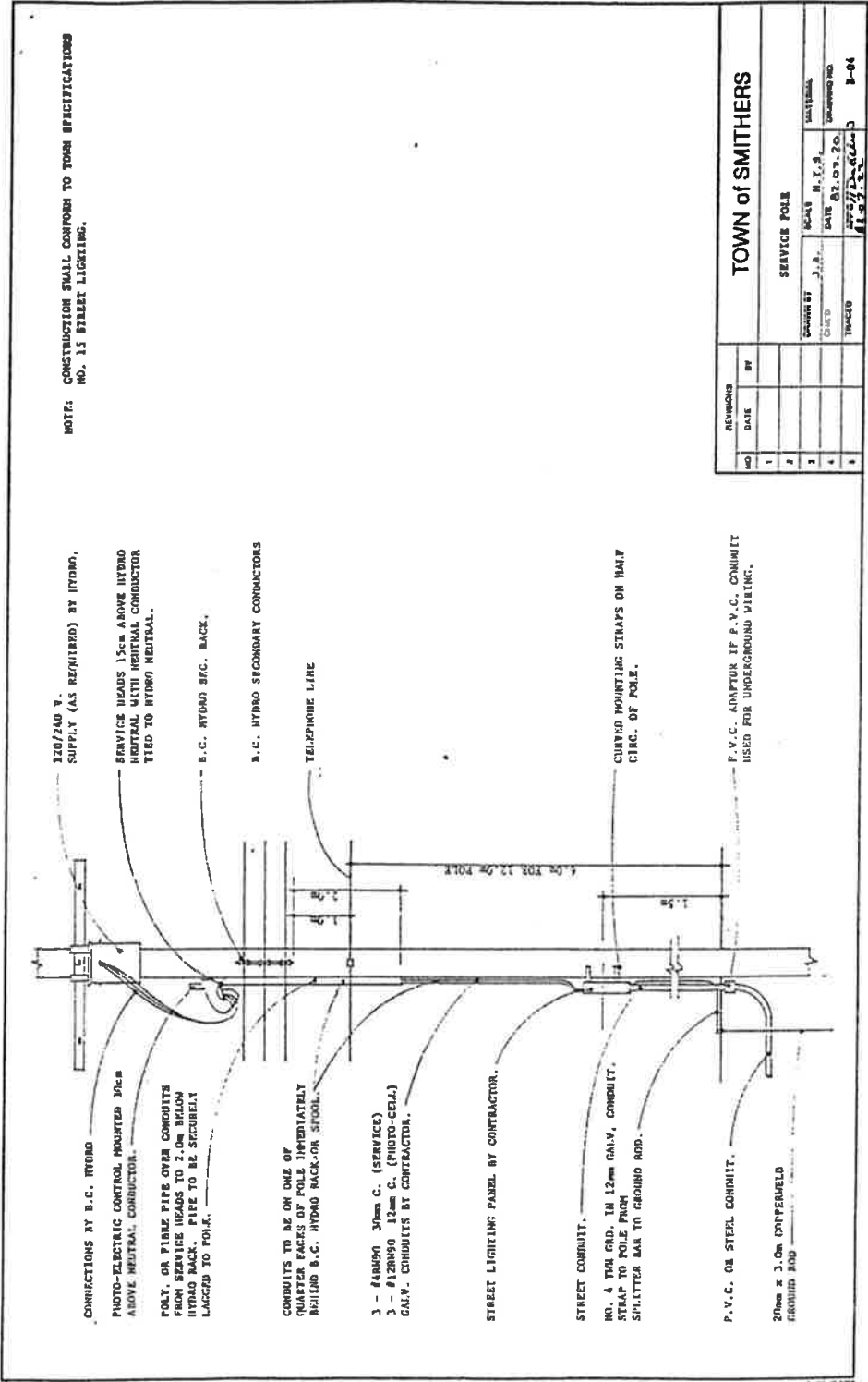
DRAWING E-02



DRAWING E-03

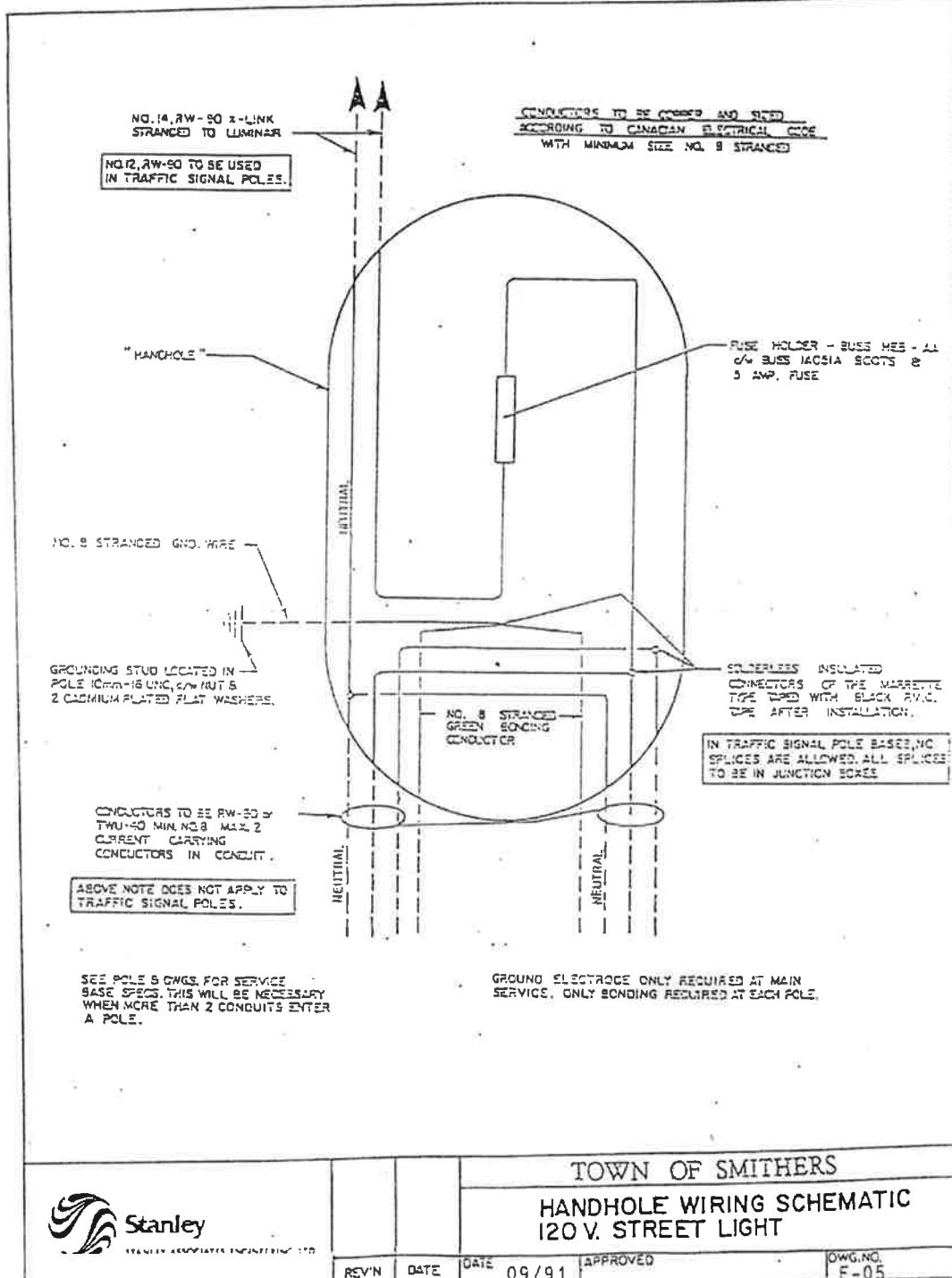
TOWN OF SMITHERS
SCHEDULE "A" TO BYLAW NO. 1800
Page A-117

DRAWING E-04

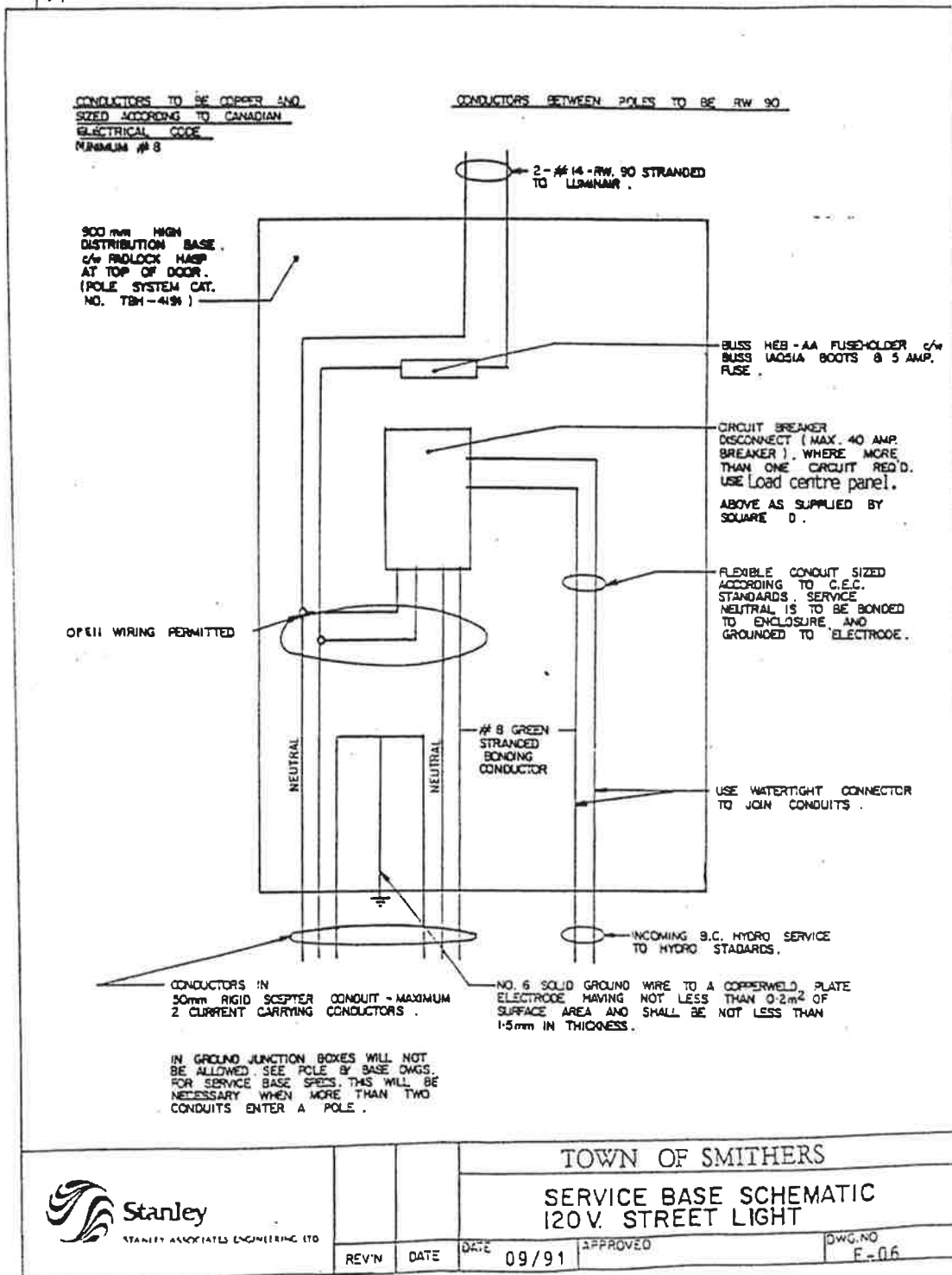


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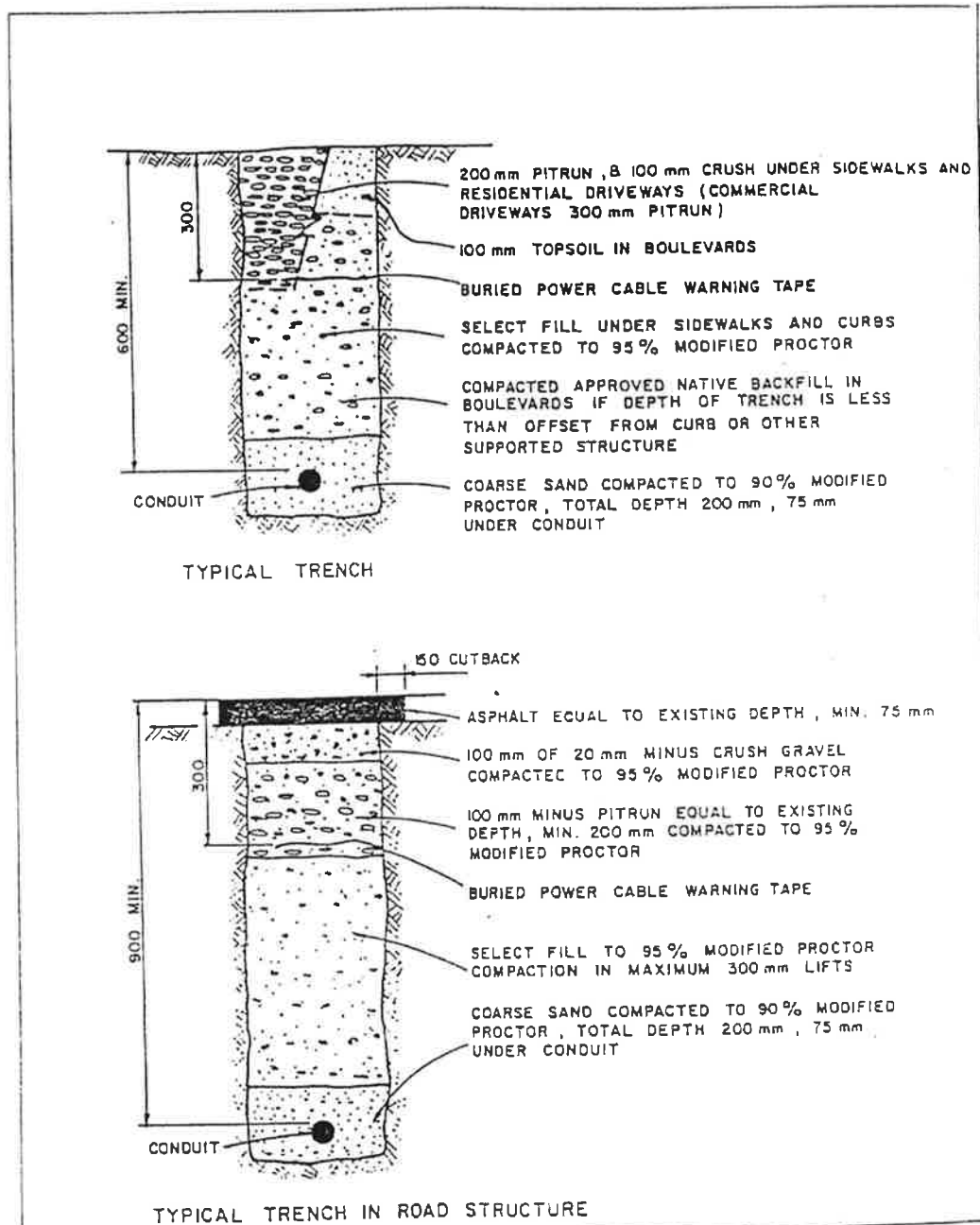
116



DRAWING E-06



DRAWING E-07



SCHEDULE "B" TO BYLAW NO. 1800
Level of Works & Services

1.0 LEVEL OF WORKS & SERVICES

The level of works and services to be provided in subdivisions and developments shall conform to the following tables for the various zones as set out in the Town of Smithers Zoning Bylaw and amendments thereto.

Table B-1. Level of Works & Services

ZONE	Municipal Water Service	Private Water	Municipal Sanitary Service	Private Sanitary	Storm Sewer	Ditching	Ornamental Street Lighting	Hydro Pole Mounted	Underground Non-Municipal Services
<u>Agricultural:</u> A-1	N/A	Required	N/A	Required	N/A	Required	N/A	N/A	N/A
<u>Urban Residential:</u> R-1,2,2A,3,4,5	Required	Where Approved	Required	N/A	Required	Where Approved	Required	N/A	Required
<u>Rural Residential:</u> R-6,7	Required	Where Approved	Required	Where Approved	Permitted	Required	N/A	Required	N/A
<u>Commercial:</u> C1A,B,2,3,4A,B,5,6,7	Required	Where Approved	Required	Where Approved	Required	Where Approved	Required	N/A	Required
<u>Industrial:</u> M-1,2A,3	Required	Where Approved	Required	Where Approved	Required	Where Approved	Required	Where Approved	M-1 = Required M-2,2A,3 = Permitted Cable Not Required
<u>Public Use:</u> P-1,1A,2,3,4	Required	Where Approved	Required	Where Approved	Required	Where Approved	Required	Where Approved	Required Except Cable

Table B.2 Minimum Highway Standards

ARTERIAL								
ZONE	ROW Width	Pavement Width	On Street Parking	Curb & Gutter	Sidewalk Requirement			
					Location	Width	Curb Type	
<u>Agricultural:</u> A-1	25m	14m	None	None	None	N/A	N/A	
<u>Urban Residential:</u> R-1,2,2A,3,4,5	25m	14m	None	Yes	Both Sides	1.5	Non-Mountable	
<u>Rural Residential:</u> R-6,7	25m	14m	None	None	N/A	N/A	N/A	
<u>Commercial:</u> C-1,A,B,2,3,4,A,B,5,6,7	25m	14m	None	Yes	Both Sides	1.5	Non-Mountable	
<u>Industrial:</u> M-1, 2,2A,3	25m	14m	None	Yes	Both Sides	1.5	Non-Mountable	
<u>Public Use</u> P-1,A,2,3,4	25m	14m	None	Yes	Both Sides	1.5	Non-Mountable	

TOWN OF SMITHERS
SCHEDULE "B" TO BYLAW NO. 1800
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COLLECTOR							
ZONE	ROW Width	Pavement Width	On Street Parking	Curb & Gutter	Sidewalk Requirement		
					Location	Width	Curb Type
<u>Agricultural:</u> A-1	20m	9.2m	3.4m Shoulders	None	None	N/A	N/A
<u>Urban Residential:</u> R-1,2,2A,3,4,5	20m	11m	Yes	Yes	One Side	1.5m	Non-Mountable
<u>Rural Residential:</u> R-6,7	20m	9.2m	3.4m Shoulders	None	N/A	N/A	N/A
<u>Commercial:</u> C-1,A,B,,2,3,4,A,B,5,6,7	20m	11m	Yes	Yes	Both Sides	Varies	Non-Mountable
<u>Industrial:</u> M-1 M-2,2A M-3	20m	11m	Yes	Yes	One Side One Side Optional	1.5m	Non-Mountable
<u>Public Use</u> P-1,A,2,3,4	20m	11m	Yes	Yes	Both Sides	1.5m	Non-Mountable
LOCAL							
ZONE	ROW Width	Pavement Width	On Street Parking	Curb & Gutter	Sidewalk Requirement		
					Location	Width	Curb Type
<u>Agricultural:</u> A-1	20m	8.5m	1.5m Shoulders	None	None	N/A	N/A
<u>Urban Residential:</u> R-1,2,2A,3,4,5	20m (15m Bulb Radius)	11m (8.5m Bulb Radius)	Yes	Yes	One Side *One Side to Bulb in Cul-de-sac	1.5m	Varies
<u>Rural Residential:</u> R-6,7	20m	8.5m	1.5m Shoulders	None	None	N/A	N/A
<u>Commercial:</u> C-1,A,B,2,3,4,A,B,5,6,7	20m	11m	Yes	Yes	Both Sides	Varies	Non-Mountable
<u>Industrial:</u> M-1 M-2, 2A M-3	20m	11m	Yes	Yes	One Side One Side Optional	1.5	Non-Mountable
<u>Public Use</u> P-1,A,2,3,4	20m	11m	Yes	Yes	One Side	1.5	Varies

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SCHEDULE "B" TO BYLAW NO. 1800
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ZONE	LANE				Sidewalk Requirement		
	ROW Width	Pavement Width	On Street Parking	Curb & Gutter	Location	Width	Curb Type
<u>Agricultural:</u> A-1	None	None	None	None	None	N/A	N/A
<u>Urban Residential:</u> R-1,2,2A,3,4,5	7.5m	4.9m	None	None	None	N/A	N/A
<u>Rural Residential:</u> R-6,7	None	None	None	None	None	N/A	N/A
<u>Commercial:</u> C-1,A,B,2,3,4,A,B,5,6,7	7.5m	4.9m	None	None	None	N/A	N/A
<u>Industrial:</u> M-1, 2,2A, 3	7.5m	4.9m	None	None	None	N/A	N/A
<u>Public Use</u> P-1,A,2,3,4	7.5m	4.9m	None	None	None	N/A	N/A

Table B.3 Minimum Sidewalk, Walkway & Multi-Use Pathway Right-of-Way and Paving Widths

	Right-of-Way Width	Pavement Width
Walkways	3.0 m	1.5 m
Sidewalks	3.0 m	1.5 m
Multi-Use Pathways	6.0 m	3.0 m

SCHEDULE "C" TO BYLAW NO. 1800
Level of Highway Works & Services

TOWN OF SMITHERS
SCHEDULE "C" TO BYLAW NO. 1800
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