Town of Kindersley

DESIGN STANDARDS

MARCH 12, 2018

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1.0 GENERAL

1.1 Description

.1 Outlined herein are the standards intended to be the minimum standards for the construction of all improvements within the Town of Kindersley.

1.2 Requirements

.1 It shall be the Owner's responsibility to develop the subdivision in accordance with standards which are acceptable to the Town and which conform to good engineering and construction practices.

.2 All deviations from these Design Standards shall have the written approval of the Town.

2.0 DEFINITIONS

.1 **Town** means the Town of Kindersley, in the Province of Saskatchewan.

.2 **Owner** means the person or entity designated as such in the Contract Documents. This may be the land developer or the Town. Where applicable, 'Owner' may also refer to the person designated as the Site Representative of the Owner.

.3 **Contractor** means the person or entity contracted to undertake the construction works, as designated as such in the Contract Documents.

.4 **Work** means the total construction and services and the carrying out and doing of all things, whether of a temporary or permanent nature, required by or reasonable inferable from the contract documents.

3.0 SUBMISSIONS

.1 Development of new areas requires the approval of the Council of the Town of Kindersley.

.2 The Town requires a Municipal Infrastructure Services Application regarding the proposed development prior to granting approvals for the development. To this end the Owner is requested to present their proposal to the Town for approval in principle of the subdivision and development.

3.1 Preliminary Submission

.1 Prior to any development taking place, the Owner shall submit a preliminary proposal of development to the Town.

.2 The proposal shall include pertinent information as to standards of construction, requirements for capacity of water mains, sewer mains,

roadways, street patterns, utility easements and other significant aspects relating to the proposed development.

.3 The preliminary proposal shall include plans of the proposed development at a scale of 1:1000 outlining the concept of lots, blocks, and street patterns. The following shall be included on the plans:

.1 Contours and existing land surface relative to geodetic and elevation datum.

.2 Extent and size of water mains.

.3 Extent and size of sanitary sewer mains.

.4 Curb-to-curb road widths.

.5 Any other information that the Owner considers necessary to aid the Town in assessing and considering the proposed development.

.4 At such time as the Town approves the Preliminary Report along with required revisions, amendments or deletions, the Owner may proceed with the detailed design and preparation of plans and specifications for Local Improvements.

3.2 Final Submission

.1 Upon completion of the design, the following shall be submitted to the Town for approval:

.1 Two (2) sets of 22” x 34” standard hard copies

.2 Electronic PDF copy

.2 The following shall be included on the plans:

.1 Pipe size, material and invert elevations

.2 Manhole rim elevations

.3 Proposed finished grade elevations for all pipe alignments

.4 Proposed lot grading

.5 Design sidewalk or top of curb elevations

.6 Depth of all sanitary sewer connections at the property line

.3 No construction shall commence or be undertaken until the plans and specifications have been approved in writing by the Town.

3.3 Survey Benchmarks

.1 Prior to the commencement of the construction of the Work, the Owner shall provide two (2) permanent survey benchmarks in the Development Area.

.2 The elevation of each benchmark shall be established to a geodetic datum.

.3 These reference points shall be available for use for all Work in the development area.

3.4 Record Drawings

.1 Upon completion of the construction of the Work, the Owner shall submit "Issued for Record" drawings to the Town. The following copies of the record drawings are to be provided:

.1 Two (2) sets of 22" x 34" standard hard copies

.2 Electronic PDF copy

.3 Electronic AutoCAD copy

4.0 GAS, POWER, TELEPHONE SERVICES & STREET LIGHTS

.1 The gas, power, street light, telephone and television cable, fiber optic services to be installed underground and shall be arranged between the Owner and the respective utility companies.

.2 Any costs for these companies' services charged by the respective utility shall be paid by the Owner.

.3 Each utility company shall submit plans, designs and locations of the proposed works to the Town for approval prior to construction.

END OF SECTION

1.0 GENERAL

1.1 Description

.1 This Section describes the design requirements for water mains and appurtenances between 150 mm and 300 mm diameter for use within the Town of Kindersley.

1.2 Requirements

.1 The water distribution system shall provide water to the public that is safe to human consumption and has adequate pressure for use in domestic applications.

2.0 DESIGN FLOWS

2.1 Water Consumption Requirements

.1 For areas where the expected population density is less than 36 persons per hectare, the flow units for residential areas shall not be less than the following:

.1 Maximum daily: 30 m^3/ha/day

.2 Peak hourly: 45 m^3/ha/day

2.2 Fire Flow Requirements

.1 Minimum residential fire flow is 90 L/s

.2 Minimum commercial / industrial fire flow is 150 L/s

.3 The minimum residual pressure for the required fire flow is 140 kPa (20 psi)

2.3 Pressure Flow

.1 Hazen-William Equation shall be used for design and modeling of mains.

$$V = 0.85\ x\ C\ x\ R^{0.63} x\ S^{0.54}$$

Where: V= Velocity m/s
R = Hydraulic Radius
C = Roughness Coefficient
S = Slope of Hydraulic Gradient line

Design values of C:

Concrete	150
HDPE & PVC	140
Steel	130

2.4 Velocity

.1 Maximum design velocity shall be 1.5 m/s

.2 Maximum localized peak hour velocity shall be 2.5 m/s

2.5 Pressure

.1 Pressure within the distribution network shall meet the conditions outlined in the following table:

S. No.	Condition	Pressure (kPa)	Pressure (psi)
1	Maximum	690	100
2	Minimum Operating	275	40
3	Minimum fire pressure (sprinklers)	275	40
4	Minimum fire pressure (hydrants)	140	20

3.0 DESIGN OF SYSTEM COMPONENTS

3.1 Pipe Location

.1 Mains shall be located either within the roadway and at least 2.0 meters horizontally from any proposed sidewalk, curb or other service structure, or at the Town's discretion.

3.2 Pipe Material

.1 Pipe shall be DR18, PR 235 psi to cast iron OD dimensions Polyvinyl Chloride conforming to AWWA Specification C900, complete with factory installed elastomeric gaskets.

3.3 Pipe Size

.1 Minimum size of pipe shall be 150 mm inside diameter.

.2 Main sizes may be increased or decreased by the Town at their discretion.

3.4 Network

.1 Dead ends shall be minimized by looping mains and where avoiding dead end is not possible a FH or other flushing device shall be installed after obtaining due approval from Town.

.2 Interconnection of mains shall be designed in accordance with the following table:

Diameter (mm)	Location	Maximum Interval (m)
150	Low density residential	600
150	Medium density residential	500
200	Medium density residential, industrial	500

3.5 Depth

.1 Mains shall be installed to provide a minimum depth of cover of 3.0 meters below final finished grade or at the Town discretion.

3.6 Cathodic Protection

.1 A 5.44 kg (12 lb) zinc anode shall be installed to protect all valves, hydrants and cast iron fittings.

3.7 Thrust Blocks

.1 Thrust (reaction) blocks shall be applied at all bends, tees, changes in pipe diameter or other fittings.

3.8 Clearance

.1 Water main shall pass over adjacent sewer mains

.2 The minimum horizontal and vertical clearance between outer faces of the pipes shall be 300 and 150 mm respectively.

3.9 Valves

.1 Valves shall be provided on the mains so that:

.1 No more than three (3) valves are closed to isolate any one section of water main

.2 Only one hydrant is isolated at any one time.

.2 Valves shall be located at the extension of the street property lines at street intersections or as otherwise approved by the Town.

.3 Valves on hydrant leads shall be located in the roadway.

3.10 Fire Hydrants

.1 Fire hydrant installation is not allowed in primary water main but is allowed in secondary water main.

.2 Maximum spacing for fire hydrant shall be in accordance with “Water Supply for Public Fire Protection, Fire Underwriters Survey, 1999:

.1 Maximum spacing of hydrants shall be such that the curb in front of any dwelling is no more than 90 (ninety) meters from any hydrant, as measured along the traveled road surface.

.3 Any hydrant leads greater than 30 m in length shall be considered to be a dead end water main and the minimum diameter for dead end water main shall apply.

.4 All hydrant leads connected to mains 300 mm or larger, and all hydrant leads in commercial, industrial and high density residential area shall be valved.

END OF SECTION

1.0 GENERAL

1.1 Description

.1 This Section describes the design requirements for gravity sanitary sewer mains, manholes and sanitary forcemains for use within the Town of Kindersley.

1.2 Requirements

.1 The sanitary sewer system shall collect all sanitary sewage generated in a development and convey it for treatment.

.2 The sanitary sewage collection system shall be designed to be completely separate from the storm water drainage system. Interconnectivity with storm water pipes is not acceptable.

2.0 DESIGN FLOWS

2.1 General

.1 Any sanitary sewer extension shall connect appropriately with existing collection network and shall possess adequate capacity to meet the demand of future developments complying to town development plans.

.2 Sanitary sewer shall have adequate capacity to keep functioning satisfactorily at peak and low flows.

2.2 Flow Calculation

.1 Peak design flow (PDF) is the sum of peak dry weather flow (PDWF), the inflow and infiltration (I&I) allowance, and the weeping tile flow (WTF) allowance.

.2 PDWF shall be obtained by multiplying the average dry weather flow ADWF by peaking factor.

.3 The pf shall be obtained by using Harmon Formula,

.4 PDF = (ADWF) x PF) +I&I +WTF

where PF = 1+14 / (4+$P^{1/2}$) where P is population in thousands.

2.3 Population and Dry Weather Flow

.1 Factors that shall be used to estimate population and dry weather flows are summarized in the following table:

Sanitary Sewer Design Factors

Land Use Category	ADWF (L/capita/d)	Equivalent Population [1] (p/ha)	Comment
Low Density Residential	290	42	Typical suburban neighbourhood.
Medium to High Density Residential	290	60	Suburban centre. Mix of medium and high density.
Central Commercial	Actual or estimated[2]	330	Includes central business district, large hotels, and office towers.
Secondary Commercial and Local Commercial		160	Includes wholesale and retail outlets, storage facilities, shopping centres, service stations, convenience stores, small and medium-sized hotels, motels, service establishments, institutions, clubs, and highway commercial.
Wet Industrial	Actual or estimated[2]	530	Includes food processors.
Dry Industrial		16	Includes storage and light manufacturing.
Mixed Industrial		130	Includes a combination of wet industrial, dry industrial, and commercial.

1) Equivalent populations may be used if population densities are not known.
2) Actual or estimated ADWF shall be approved by the TU Department and may be used in place of the equivalent population. However, the equivalent population shall still be calculated for use with the Harmon Formula.

2.4 Infiltration Allowance

.1 The infiltration allowance shall be determined by result of the hydrological investigation performed for the development.

.2 In absence of above information an infiltration allowance of 0.17 L/s/H shall be used.

2.5 Weeping Tile Flow Allowance

.1 Weeping tile flow allowance shall be decided in accordance with the Town recommendation and advice depending upon scenario.

3.0 GRAVITY FLOW

.1 Gravity sewer mains shall be sized for full flow during the total design peak flow (Q in m^3/s).

.2 Manning's equation shall be used for the design of gravity sewer:

Q = (A* $R^{2/3}$ $S^{1/2}$)/n,

where A= Pipe cross sectional area, R = Hydraulic Radius, S= Slope of HGL and n = Manning coefficient = 0.013 for all approved materials in straight alignment.

3.2 Velocity

.1 A mean velocity of 0.61 m/s shall be maintained during average flow conditions to ensure self-cleaning effect

.2 The maximum velocity shall be limited to 3 m/s to reduce risk of scour and turbulence.

3.3 Slope

.1 For partial flows, collection mains shall have a min slope of 0.55% for the length of first section.

.2 Maximum slopes shall be based upon limiting the maximum velocity.

.3 Minimum slope for full flow straight sewers shall be as follows:

Sewer Size (mm)	Minimum Slope (%)
200	0.35
250	0.28
300	0.22
375	0.15
450	0.12
525 and greater	0.10

3.4 Curved Sewers

.1 The coefficient of roughness and minimum permissible slopes shall be subject to approval by Town.

.2 The minimum radius of curvature shall be in accordance to manufacturer specifications

.3 The slope of curved sewer shall comply the below table:

Sewer Size (mm)	Minimum Slope (%)
200	0.40
250	0.30
300	0.25
375	0.17
450	0.13
525	0.11
600 and greater	0.10

4.0 PRESSURE FLOW

.1 Hazen-William Equation shall be used for design of sanitary force mains:

$$V = 0.85x\ C\ x\ R^{0.63}x\ S^{0.54}$$

Where V= Velocity m/s, R= Hydraulic Radius, C = Roughness Coefficient and S = Slope of Hydraulic Gradient line

.2 Design Value of roughness for Concrete = 150, HDPE & PVC = 140, Steel = 130

5.0 DESIGN OF SYSTEM COMPONENTS

5.1 Pipes

.1 Sewer mains shall be PVC sewer pipe conforming to ASTM D3034, DR35 or as otherwise approved.

.2 The basic design criteria for three types of mains is given in the below table:

Type	Sewage Path	Diameter (mm)	Service Connections	Comments
Sanitary Collection Main	Within neighbourhoods to trunks	Min 200	Allowed	-
Trunk Sanitary Main	From neighbourhoods to WWTP or SPS	Min 375	Not Allowed	Connections may be allowed at manholes with the Towns approval
Force Main	From SPS to gravity sewer	Min 100	Not Allowed	Smaller diameters may be used in conjunction with grinder pumps. A smooth flow transition to the gravity sewer is to be designed to minimize turbulence at the point of discharge

.3 Sizing

.1 Minimum sizes as per the above table.

.2 The gravity mains shall be sized to accommodate the peak flows and if applicable to should be able to accommodate the future extension plans of the Town.

.3 Force mains shall be sized to accommodate the flow for multiple pumps in parallel operation.

.4 Depth

.1 Mains shall be installed to provide a minimum depth to invert of 2.8 meters from finished grade.

.2 Shallower pipes shall require the approval of the Town.

.3 Force mains shall be installed at an adequate depth so as to prevent freezing.

.4 Not less than 2.5 m of cover shall be provided without Town office approval

.5 Clearance

.1 Sewer mains shall pass under adjacent water mains

.2 Minimum clear horizontal clearance between pipes shall be 150 mm.

.3 Minimum clear Vertical clearance between pipes shall be 300

.6 Pipe Strength

.1 Sewer Mains shall be PVC sewer pipe conforming to ASTM D3034, DR35 or as otherwise approved.

.2 Back fill weight shall be a minimum of 2,162 kg/m3 unless a detailed investigation indicates that a lesser value can be used.

.7 Location

.1 Mains shall be located within the roadway or boulevard and at least 2.0 meters horizontally from any proposed sidewalk, curb or other service structure.

5.2 Manholes

.1 Manholes shall be provided at all changes in grade and alignment, at junctions, and at end of each line.

.2 Locked Manholes

.1 All manholes shall be locked when not located on roadway, located along cross walk and public pathways, and located in public accessible proximity.

.3 Inflow

.1 Manholes shall be designed to minimize storm water inflow.

.2 All low lying area manholes shall be sealed.

.4 Spacing

.1 Maximum spacing between manholes shall be 110 meters.

.2 Maximum spacing between manholes on curved sewers shall be 100 m.

.5 Drop Structure

.1 A drop structure with an external riser shall be used when crown of the inlet pipe is 70 mm or more above outlet crown.

5.3 Stubs

.1 Where stubs are installed to facilitate future development, they shall be:

.1 Installed at a depth as great as possible to ensure flexibility in the future.

.2 Capped with a watertight cover.

6.0 SEWAGE LIFT STATIONS

.1 Sewage pump stations may be used to eliminate excessive depth of sanitary sewers by pumping sewage to an elevation adequate to continue gravity sewage flow.

6.2 General

.1 Submit a 'Sewage Lift Station Design Report'

.2 Designs shall be standardized as much as possible to:

.1 Allow interchangeability of spare parts

.2 Promote safe and reliable operation

.3 Minimize space requirements

.4 Reduce life cycle costs

.3 Availability of local repair services shall be considered

6.3 Configuration

.1 Stations shall be design for wet well only or for wet well/dry well configurations.

.2 Separate wet and dry wells shall be provided in staitons with higher pumping requirements, with pumps located in the dry well.

.3 If more than one technically feasible option exists, a comparison of cost analysis shall be presented in the Sewage Lift Station Design Report.

6.4 Location

.1 Lift stations shall be located so as to:

.1 Minimise visual, odour, noise and aesthetic impacts

.2 Provide easy access for maintenance.

.3 Not be subjected to surface ponding or flooding during major storm events.

.4 Be located on a separately titled parcel.

6.5 Building

.1 All lift stations shall be located inside a building:

.1 All electrical equipment, controls/instrumentation, valves and heating/ventilation equipment shall be housed in the building.

.2 Design and installation of the heating and ventilation system shall be in accordance with applicable occupational health and safety legislation, electrical codes, and environmental guidelines.

.3 Standby power shall be provided in all pumping stations.

.1 Generators or auxiliary drives powered by diesel or natural gas engines may be used.

.4 Design and installation of all electrical equipment and all gas fired heating equipment shall be in accordance with applicable codes, legislation and approval requirements.

.5 Adequate lighting for access and maintenance shall be provided.

.6 Suitable and safe means of access shall be provided to dry and wet wells.

.1 Wet wells shall have separate access and be ventilated independently of the dry well.

.2 All ladders, railings, platforms, etc. shall be in accordance with applicable occupational health and safety legislation and regulations.

.7 Care shall be taken to avoid cross connections with any potable water supplies

.8 The controls and alarm system shall be compatible with that in use in other Town pump stations, or as specified by the Town.

6.6 Dry Well

.1 Instrumentation shall include alarm systems, gas monitors, wet well level indicator gauges, hour metres and ampere metres

.2 The dry well shall be ventilated by mechanical means. Pressure ventilation with heating of intake air is required.

.3 A dehumidifier shall be provided to control corrosion in dry wells.

.4 A sump pump is required to remove leakage and drainage.

.5 Metal dry wells shall have cathodic protection against corrosion using a rectifier-type system.

6.7 Wet Well

.1 A bubbler or ultrasonic system shall be used to detect liquid level in the wet well.

.2 Screens shall be provided to protect pumps. Screens shall be accessible and easily cleaned.

.3 The wet well inlet pipe shall be valved.

.4 Ventilation of separate wet wells may be either by mechanical or natural means.

.5 Prevention of odours in wet wells shall be considered.

.6 Wet well storage capacity shall be adequate to prevent frequent starting and stopping of pumps.

6.8 Pumps

.1 Pumps shall be operated with a lead/lag system.

.2 A minimum of two pumping units are required, each of the same capacity and each capable of pumping the anticipated peak hourly inflow.

.3 Single and parallel operation of pumps shall be considered when selecting design flow and operating points.

.4 Pumps shall be identical and interchangeable.

6.9 Force Mains

.1 Discharge points shall be designed to reduce the production of odours and hydrogen sulphide gas.

6.10 Overflow Connection

.1 A bypass connection to an adjacent or downstream sanitary sewer main shall be provided wherever possible.

.1 The design of the bypass should not assume overflow of the wet well.

.2 Backflow prevention must be provided on any bypass connection.

END OF SECTION

1.0 GENERAL

1.1 Description

.1 This Section describes the design requirements for storm sewer and manholes for use within the Town of Kindersley.

1.2 Requirements

.1 The storm sewer system shall collect all storm water generated in a development and convey it for storage or treatment.

.2 The storm drainage system shall be designed to be completely separate from the sanitary sewer collection system. Interconnectivity with sanitary sewer mains is not acceptable.

2.0 DESIGN FLOWS

.1 The storm drainage system for proposed developments shall consist of both major and minor components

2.1 Minor System:

.1 Consists of piping, manholes, catch basins and outfall structure that are able to convey runoff from more frequent lower intensity storm events.

.2 Shall be designed for one (1) in five (5) year event.

.3 Rational method shall be used to determine the design flow

2.2 Major System:

.1 Consist of overland street drainage, detention facilities, park land and other lands that is required to convey runoff from less frequent higher intensity storms.

.2 The system shall be designed to accommodate the 1-in 100 year, 24 hour design event.

.3 The maximum depth of ponding shall be 0.4 m for all roads.

2.3 Rational Method

.1 The formula for design peak runoff rate shall be:

$$Q = 2.78 \times C \times I \times A$$

Where: Q= Peak design flow L/s, C = runoff coefficient, I = Rainfall intensity mm/hr, A= area of contributing runoff.

.2 Utilize a run-off coefficient of 0.35 for residential and 0.65 for commercial areas

2.4 Rainfall Intensity Duration and Frequency Data

.1 Rainfall intensity duration and frequency Data and curve for Kindersley to be developed from Environment Canada rainfall data.

2.5 Time of Concentration

.1 The duration of rainfall used to determine intensity is equal to time of concentration.

.2 The time of concentration equals the time of overland flow to the storm drainage system inlet plus the time of travel in the upstream conduit.

.3 Overland flow time to curbside in residential and commercial areas shall not exceed 10 min in duration.

.4 Gutter flow time shall not exceed 5 min.

.5 The maximum time of concentration to an upstream inlet for a residential development shall be 15 min.

.6 The time of travel in conduit shall be based on full flow velocity.

2.6 Coefficient of Runoff

.1 The value of runoff coefficient shall be estimated from the following equation.

$$C = \frac{(C_n A_n) + (C_{n-1} A_{n-1}) + \cdots + (C_1 A_1)}{A_n + A_{n-1} + \cdots + A_1}$$

Where: C= Runoff coefficient, A= Area (gross), and n = No. of Sub Areas distinguished by land use.

2.7 Water Levels

.1 In systems with storm water storage basins, the effect of higher water level shall be considered in the design of minor system property drainage.

.2 For Major system design the HWL of 1 in 100-year event shall be restricted to public land in all case.

.3 Basement floors shall be constructed above HWL and walkout basements shall be constructed with a min free board of 1 m above the HWL.

2.8 Gravity Flow: Minor System

.1 The Manning equation shall be used for design and modeling of gravity flow in storm drainage pipe:

Q = (A* $R^{2/3}$ $S^{1/2}$)/n

Where: A = Pipe cross sectional area, R = Hydraulic Radius, S= Slope of HGL and n = 0.013 Manning's coefficient for all approved materials in straight alignment.

.2 Velocity

.1 Flow velocities shall not be less than 0.90 m/s at full flow.

.2 When flow Velocity exceeds 3 m/s, invert erosion in the pipe has to be considered.

.3 Size

.1 The minimum size of storm drainage pipe shall be 300 mm diameter.

.4 Slope

.1 Minimum slopes based on full flow are provided in the table below.

Minimum permitted pipe slope at full flow for straight sewer	
Pipe size (mm)	**Minimum Slope (%)**
300	0.44
375	0.32
450	0.26
525	0.22
600	0.18
675	0.15
750	0.13
900 and above	0.1

.5 Curved Pipes

.1 In case of curved drainage pipes, the roughness coefficient and slopes shall be subject to approval the Town.

Minimum permitted pipe slope at full flow for Curved sewer	
Pipe size (mm)	**Minimum Slope (%)**
300	0.50
375	0.37
450	0.29
525	0.24
600	0.20
675	0.17
750	0.12
900 and above	0.10

2.9 Gravity Flow: Major System

.1 On streets the maximum acceptable storm water velocity shall be 0.45 m/s

.2 In other areas, the overland flow shall comply the below table

Permissible depths for Submerged Objects	
Water Velocity (m/s)	**Permissible depth (m)**
0.5	0.8
1	0.32
2	0.21
3	0.09

3.0 DESIGN OF MINOR SYSTEM COMPONENTS

3.1 Catch Basins

.1 Drainage Length

.1 The first catch basin shall be located at a maximum distance of 200 m from nearest highest point

.2 Catch basins within storm drainage systems shall have a typical spacing of 120 m.

.2 Capacity

.1 Surface water shall intercept with number of catch basins such that the inlet capacity is sufficient to receive the design flow.

.2 Catch basin capacity shall be considered for both sump conditions and on inlet grate type.

.3 Barrels

.1 All catch basins shall be 600 mm precast SRC section with provision of sump.

.4 Leads

.1 All catch basins shall discharge in to storm drainage at a manhole.

.2 The maximum lead length shall be 30 m.

.3 The minimum lead size shall be 250 mm with minimum slope of 2%.

3.2 Pipes

.1 The sewage collection system shall consist of two types of pipes as shown in below table:

Pipe Description		
Storm Pipe Type	**Storm Water Path**	**Diameter**
Local	From service connections and catch basin manholes to trunk	Minimum 300
Trunk	From neighbourhood to receiving water	Minimum 1350

.2 Sizing

.1 Storm water pipes shall be sized to accommodate the design flows for proposed contributing are

.2 It also shall reasonably be accommodating expected flows from extensions and future development areas described in the sector plan.

.3 Depth of Cover

.1 The depth of minor storm water drainage system shall be sufficient to meet the following requirements

a) Frontage piping shall be adequate depth to receive connections from adjacent properties

b) Minimum depth of cover of 1.85 m to crown of pipe

.4 Clearance

.1 The minimum vertical clearance from the bottom of one pipe to the top of next lowest pipe shall be 150 mm

.2 Where pipes are laid on undisturbed soil, the minimum horizontal clearance between the outer walls of adjacent pipe shall be 300 mm.

.3 If pipes are to be installed in a common trench with other pipes, clearance must be approved by Town.

.5 Pipe Strength

.1 Pipe strength and wall thickness shall be determined in accordance with AWWA standard design manuals for various pipe materials.

.2 The strength of pipe shall be sufficient to carry the backfill load and the surcharge loading due to vehicles

.3 Minimum backfill weight shall be 2162 kg/m^3 unless a detailed geotechnical investigation indicates that a lesser value can be used.

.6 Curved Drainage Pipe

.1 Curved drainage pipes can be built with radius pipes or bends.

.2 Permissible minimum radius shall depend upon manufacturer's specifications.

.3 Curbs shall not be undercut to accommodate curvature.

3.3 Manholes

.1 Manholes shall be located at the upstream end of each line, at changes in size or alignment, at all junctions and at catch basin connections.

.2 Locked Manholes

.1 Manholes shall be locked when not located on roadway, cross walks or along public pathway or in an area that will be generally accessible to public.

.3 Spacing

.1 The maximum spacing between man holes shall be 120 m for maintenance considerations.

.2 The maximum spacing for curved pipes shall be 100 m unless otherwise approved by the Town.

.3 In no case shall spacing be greater than 250 m.

.4 Diameter

.1 The minimum manhole diameter shall be 1.2 m.

.2 For pipes at depths greater than 6 m special manholes are required with safety platform at intermediate levels. Wherein the lowest plate form shall be above incoming flow and maximum spacing of safety plate form is limited to 6 m.

END OF SECTION

1.0 GENERAL

1.1 Description

.1 This section describes the design requirements for lot servicing and the design of lot drainage.

1.2 Requirements

.1 Water and sanitary sewer service connections shall be provided for every property.

.2 All services to be installed by the Owner shall be designed in such a manner as to least interfere with the existing services.

.3 Any cost incurred on account of the installation of services shall be borne by the Owner.

2.0 WATER SERVICE CONNECTIONS

.1 Service pipe from the main property line shall have a minimum depth cover of 2.80 m from finished grade.

.2 Service connections shall be located 3 m from the front corner of the lot and 300mm outside the front property of the lot.

.3 Water Service pipe shall be 25 mm HDPE DR9 polyethylene tubing, with series 200 tracer wire conforming to ASTM D2737 or otherwise as approved.

.4 Service boxes shall be set vertical with the tops at the sidewalk elevation. At the time of sidewalk construction, the letters “CC” shall be neatly marked into the concrete directly opposite each service box.

.5 Curb stop stem shall be stainless steel rod and cotterkey. Sacrificial anodes shall be installed on the curb stop box. The bottom 1.5 meters of the curb stop box wrapped with denso tape.

.6 The Town must be contacted for assessment for any new service connection prior to installation or reuse of any existing service connection.

.7 Old connections that are not re-used will have to be cut off at the mains.

3.0 SEWER SERVICE CONNECTIONS

.1 Service pipe at the front property line of each lot shall have a minimum depth of 2.8 m below final lot grade.

.2 Service pipe shall be of a minimum of 100 mm diameter.

.3 Service pipe shall be of PVC or as otherwise approved.

.4 Service pipe shall be connected to the sewer main with an approved saddle.

.5 The Town must be contacted for assessment for any new service connection prior to installation or reuse of any existing service connection. Old connections that are not re-used will have to be cut off at the mains.

4.0 LOT DRAINAGE

.1 Rear lot grades shall be 150 mm above design lane grade, unless approved by Town.

.2 Front finished grade elevations are to be set at 600 mm above the design sidewalk or top of curb elevations.

END OF SECTION

1.0 GENERAL

1.1 Description

.1 This section describes the requirements of roadway design including roadway and lane surfacing, curb, gutter & sidewalks, as well street signage.

1.2 Requirements

.1 The roadway system shall consist of an integrated combination of roadways, lanes and sidewalks.

.2 All properties shall have back lane access.

2.0 DEFINITIONS

.1 **Local Roadways** are those that provide access to properties. Typical properties include:

.1 Maximum posted speed of 40 km/hr

.2 Less than 1,000 vehicles per day

.2 **Collector Roadways** carry traffic from local roads to arterial, and may also provide land access. Typical properties include:

.1 Maximum posted speed of 50 km/hr

.2 Between 1,000 – 15,000 vehicles per day

.3 **Arterial Roadways** carry traffic between suburbs, and from collector roads to freeways or expressways. Typical properties include:

.1 Maximum posted speed of 60 km/hr

.2 Between 5,000 – 30,000 vehicles per day

.4 **Industrial Roadways** are roads within industrial zoned areas.

.1 These may be classified as arterials, collectors or local roadways.

.5 **Right-of-Way (R.O.W)** the portion of land designated for roadways measured between property lines.

3.0 ROADWAY GEOMETRIC DESIGN

3.1 Layout

.1 Roadway dimensions shall be designed as per the following table:

Roadway Type	Min / Typical R.O.W. width (m)	Min Driving Lanes width (m)	Layout
Local	16 / 18	2.7	Urban cross section with rolled curb and gutter. 2 lanes undivided with parking on one or both sides
Collector	20 / 22	3.0	Urban cross section with vertical curb and gutter. 2 lanes undivided with parking on one or both sides
Arterial	30 / 38	3.0	Urban cross section with vertical curb and gutter. Minimum 2 lanes undivided or divided.
Industrial	20	3.0	Urban cross section with vertical curb and gutter. Minimum 2 lanes undivided with parking on one or both sides.
Lane	6	6	

3.2 Grade

.1 Paved Roadways:

.1 All roadways shall be crowned with a slope of 3 %.

.2 Longitudinal grade minimum 0.5 % and maximum 5 %.

.3 Minimum gutter grades along straight sections and around curves shall be 0.5 %.

.2 Unpaved Roadways (including lanes)

.1 Minimum longitudinal grade shall be 0.7 %.

.2 Lanes shall have a 3% crowned or flat cross-section.

.3 Collector, local roadways and lanes are not required to be super elevated.

.4 Surface drainage to be carried across streets at intersection in concrete swales.

3.3 Curve Radius

.1 Roadways shall be designed with the following curve radii:

Roadway Type	Centreline Radius of Curves	
	Min (m)	Typical (m)
Local	8 (Intersections)	8 12 for cul-de-sacs and crescents
Collector	400 Conform to TAC standards	400 – 5,000 Conform to TAC standards
Arterial	400	400 – 5,000
Industrial	12.5	15

3.4 Connections

.1 Roadways within a proposed development shall reflect the normal progression of connectivity, as per the below chart:

Roadway Type	Roadway Type			Min Intersection Spacing
	Local	Collector	Arterial	
Local	Yes	Yes	No	60 m
Collector	Yes	Yes	Yes	60 m
Arterial	No	Yes	Yes	450 m

4.0 ROADWAY STRUCTURE

4.1 Sub-Grade

.1 Top 150 mm (minimum) of sub-grade to be compacted to 98% of standard proctor density

4.2 Sub-Base

.1 A minimum of 300 mm thick of a good quality, well-graded pit-run gravel with a minimum CBR of 25 compacted to a minimum of 98% of the Standard Proctor Density.

4.3 Base

.1 Local Streets: Minimum 150 mm of crushed gravel base course with a minimum CBR of 65 compacted to a minimum of 100% Standard Proctor Density.

.2 Collector and Arterial Streets: Minimum 200 mm of crushed gravel base course with a minimum CBR of 65 compacted to a minimum of 100% Standard Proctor Density.

4.4 Asphalt Surfacing

.1 All streets are to be paved with an asphaltic concrete surface course.

.2 Prime approved base surface with approved priming materials, prior to placing hot asphalt.

.3 All streets are to have a fog coat on the surface.

.4 Hot mix asphalt minimum thickness:

.1 Local Streets: 50 mm

.2 Collector and Arterial Streets: 100 mm

.5 Density of finished pavement to be minimum 97% of Marshall Density.

4.5 Back Alley / Lanes

.1 All back alley / lanes shall be comprised of the following:

.1 Minimum 150 mm compacted sub-grade.

.2 Minimum 200 mm of crushed gravel base course with a minimum CBR of 65 compacted to a minimum of 100% Standard Proctor Density.

5.0 CURBS, GUTTERS, SIDEWALKS AND BOULEVARDS

5.1 Geometry and Location

.1 Curbs, gutters and sidewalks shall be constructed on both sides of all streets.

.2 Minimum sidewalk width for monolithic walks is 1.2 m.

.3 The slopes across boulevards (between sidewalks and curbs) and buffer strips shall be 3.00%.

5.2 Structure

.1 All curbs, gutters, and sidewalks shall be constructed of poured-in-place concrete in accordance with Standard Drawing 2011-02..

6.0 TOPSOIL & SEEDING

.1 Areas disturbed by construction including parks, reserves, boulevards and buffer strips shall receive topsoil and seeding.

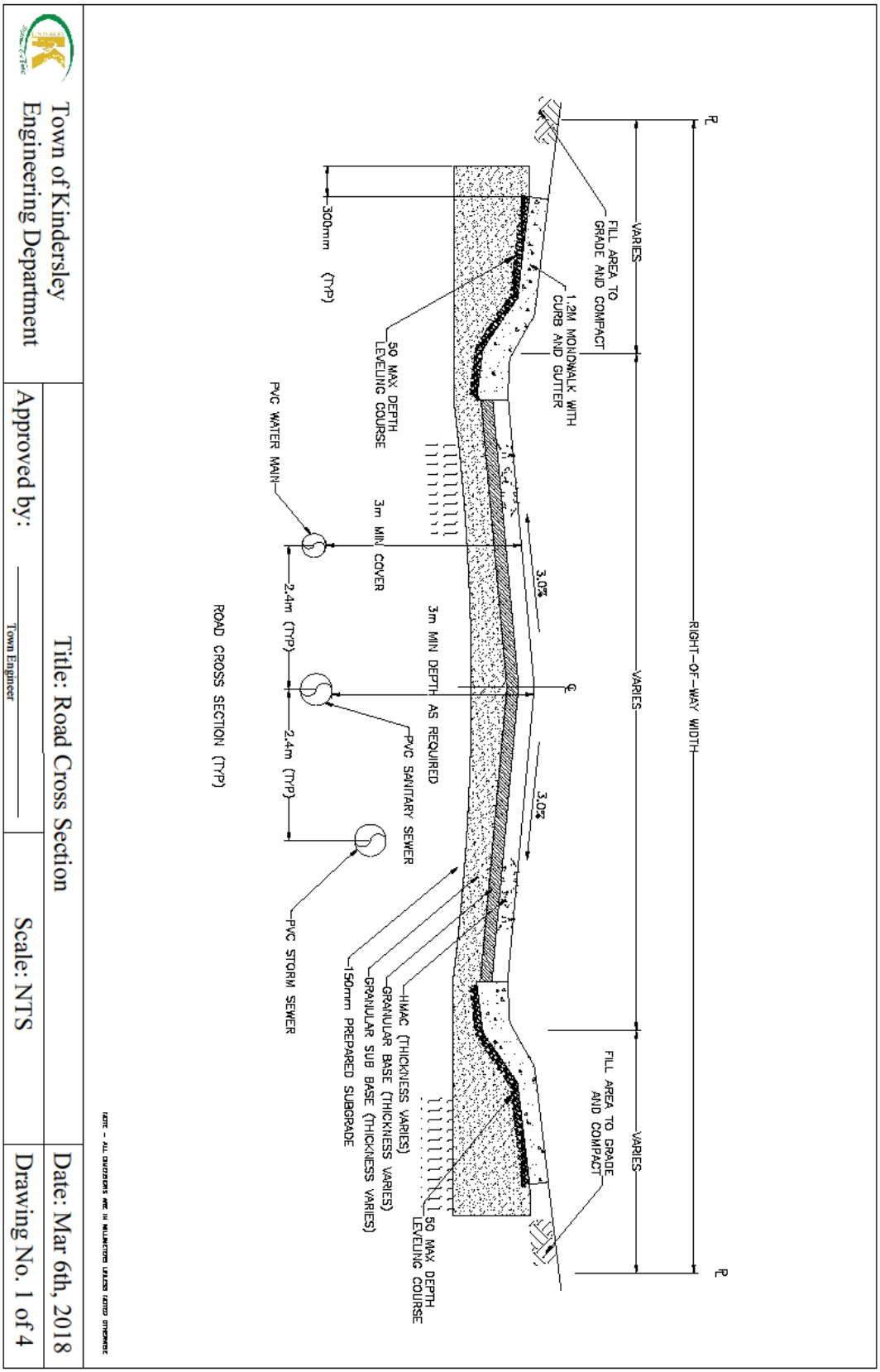
7.0 STREET NAME SIGNS AND TRAFFIC SIGNS

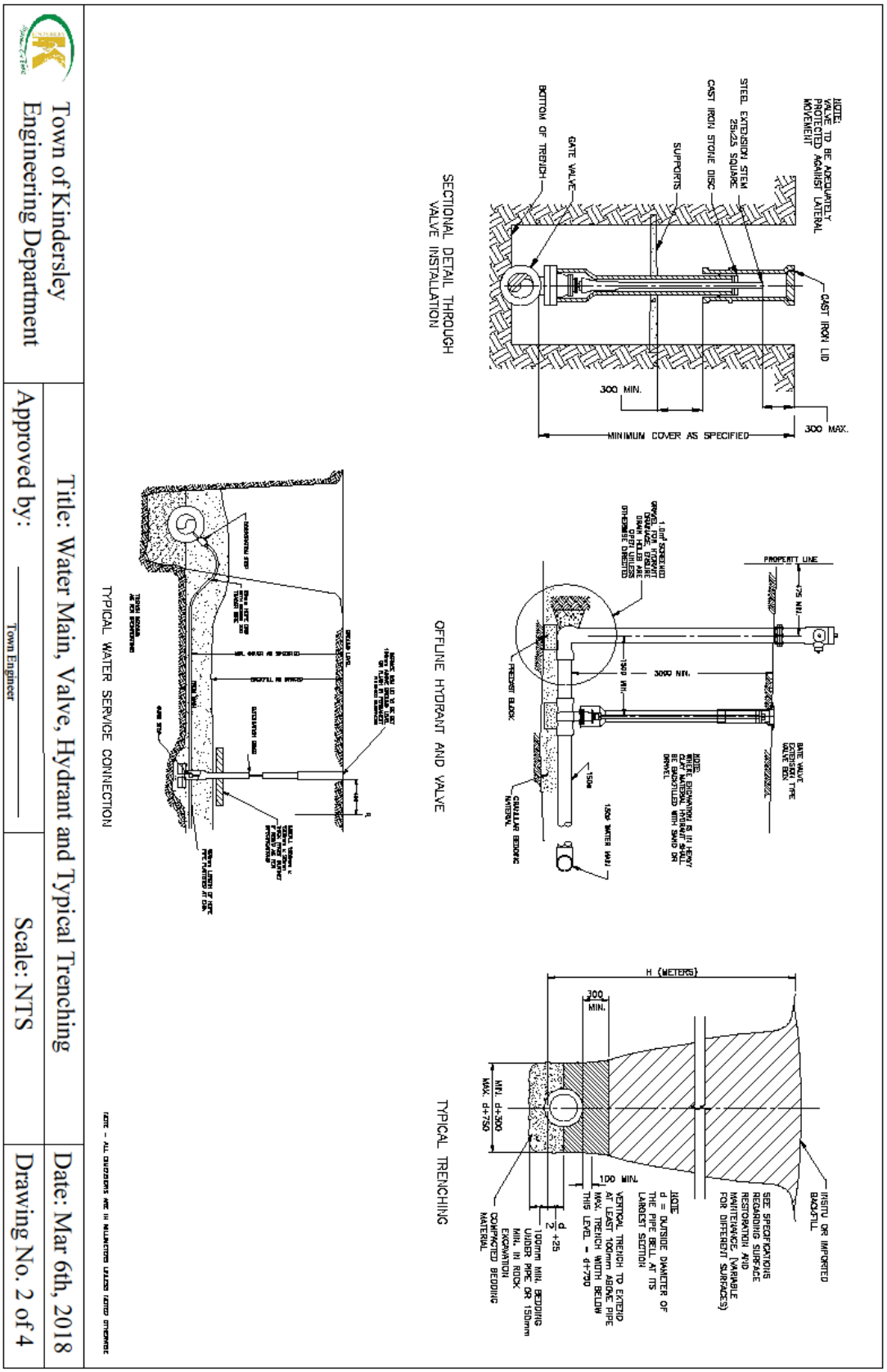
.1 The Owner is responsible for the installation of reflectorized street name signs and traffic signs.

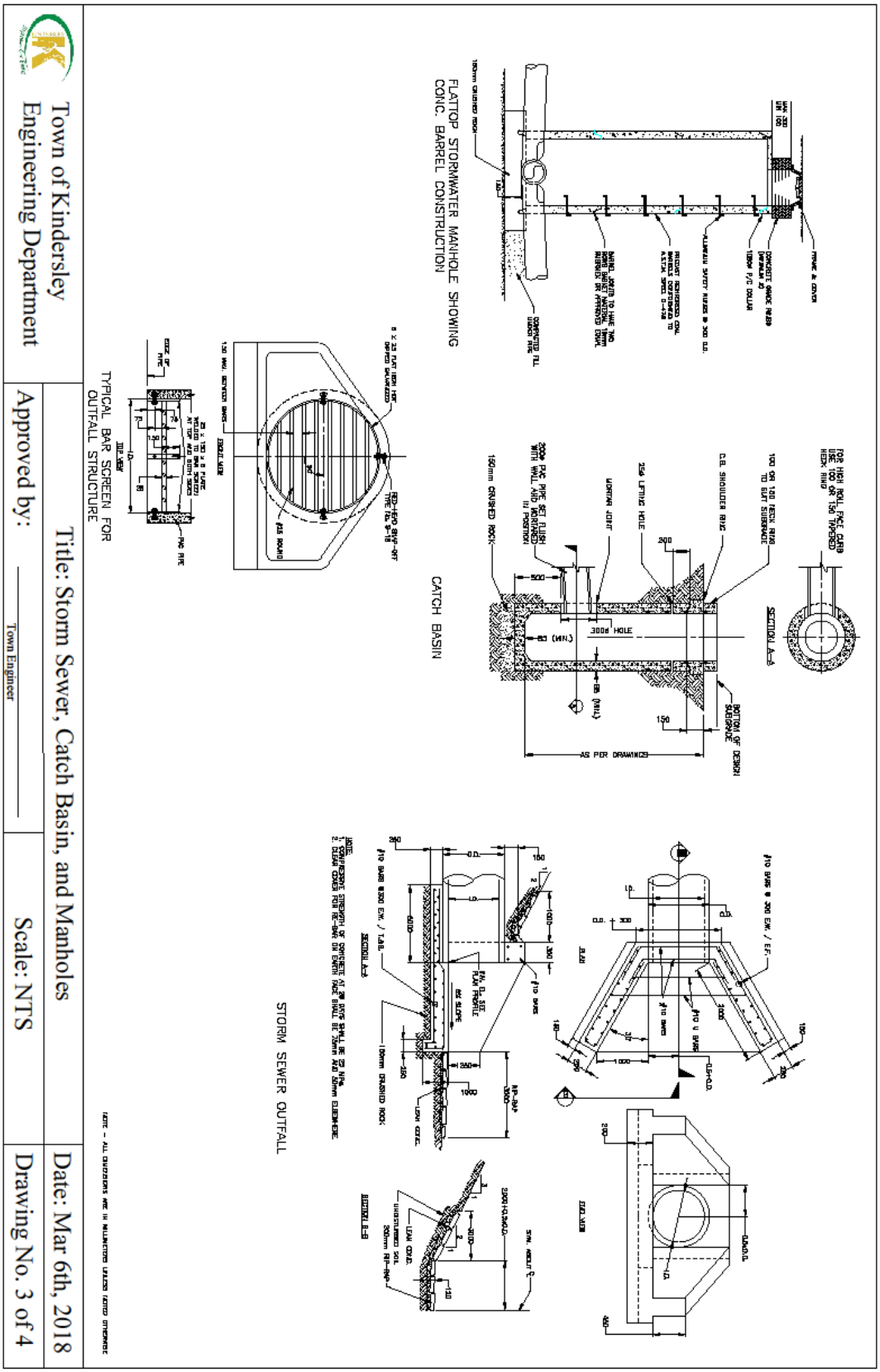
.2 Type and colour to be as approved by the Town.

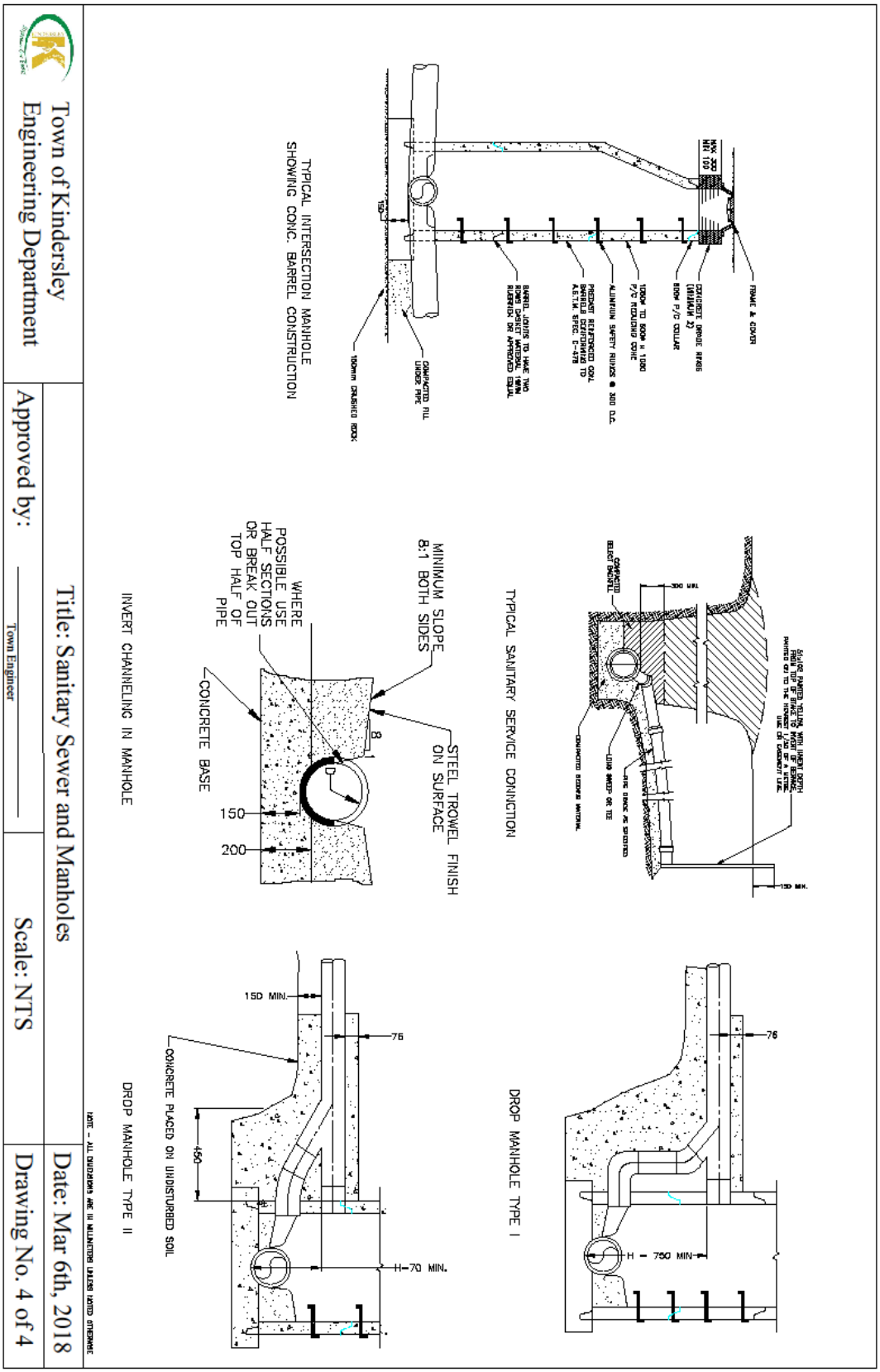
.3 Signs shall be mounted on 2 inch diameter steel posts.

END OF SECTION


Town of Kindersley
Engineering Department
Approved by:
Town Engineer
Title: Road Cross Section
Scale: NTS
Date: Mar 6th, 2018
Drawing No. 1 of 4
ROAD CROSS SECTION (TYP)
NOTE - ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE
RIGHT-OF-WAY WIDTH
VARIES
FILL AREA TO GRADE AND COMPACT
1.2M MONOWALK WITH CURB AND GUTTER
300mm (TYP)
50 MAX DEPTH LEVELING COURSE
PVC WATER MAIN
3m MIN COVER
3m MIN DEPTH AS REQUIRED
PVC SANITARY SEWER
PVC STORM SEWER
2.4m (TYP)
3.0%
HMAC (THICKNESS VARIES)
GRANULAR BASE (THICKNESS VARIES)
150mm PREPARED SUBGRADE


Town of Kindersley
Engineering Department
Approved by:
Town Engineer
Title: Water Main, Valve, Hydrant and Typical Trenching
Scale: NTS
Date: Mar 6th, 2018
Drawing No. 2 of 4
SECTIONAL DETAIL THROUGH VALVE INSTALLATION
CAST IRON LID
300 MIN.
300 MAX.
MINIMUM COVER AS SPECIFIED
BOTTOM OF TRENCH
GATE VALVE
SUPPORTS
CAST IRON STOVE DISC
STEEL EXTENSION STEM 25x25 SQUARE
OFFLINE HYDRANT AND VALVE
PROPERTY LINE
3000 MIN.
PRECAST BLOCK
GRAVITY BEDDING MATERIAL
TYPICAL TRENCHING
H (METERS)
300 MIN.
100 MIN.
INSITU OR IMPORTED BACKFILL
SEE SPECIFICATIONS REGARDING SURFACE RESTORATION AND MAINTENANCE (VARIABLE FOR DIFFERENT SURFACES)
VERTICAL TRENCH TO EXTEND AT LEAST 100mm ABOVE PIPE
MAX. TRENCH WIDTH BELOW THIS LEVEL = d+700
100mm MIN. BEDDING UNDER PIPE OR 150mm MIN. IN ROCK EXCAVATION
COMPACTED BEDDING MATERIAL
TYPICAL WATER SERVICE CONNECTION
NOTE – ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE


Town of Kindersley
Engineering Department
Approved by:
Town Engineer
Title: Storm Sewer, Catch Basin, and Manholes
Scale: NTS
Date: Mar 6th, 2018
Drawing No. 3 of 4
FLATTOP STORMWATER MANHOLE SHOWING CONC. BARREL CONSTRUCTION
CATCH BASIN
STORM SEWER OUTFALL
TYPICAL BAR SCREEN FOR OUTFALL STRUCTURE
NOTE - ALL DIMENSIONS ARE IN MILLIMETERS UNLESS NOTED OTHERWISE


Town of Kindersley
Engineering Department
Approved by:
Town Engineer
Title: Sanitary Sewer and Manholes
Scale: NTS
Date: Mar 6th, 2018
Drawing No. 4 of 4
TYPICAL INTERSECTION MANHOLE SHOWING CONC. BARREL CONSTRUCTION
TYPICAL SANITARY SERVICE CONNECTION
INVERT CHANNELING IN MANHOLE
DROP MANHOLE TYPE I
DROP MANHOLE TYPE II
CONCRETE BASE
MINIMUM SLOPE 8:1 BOTH SIDES
STEEL TROWEL FINISH ON SURFACE
CONCRETE PLACED ON UNDISTURBED SOIL
H - 750 MIN.
H-70 MIN.
150
200
75
450
150 MIN.