WHEATLAND COUNTY

DESIGN AND CONSTRUCTION STANDARDS MANUAL

OCTOBER 2016

WHEATLAND COUNTY

Where There's Room to Grow


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URBAN SERVICE AREA STANDARDS

JULY 2016

1000 GENERAL

These standards are provided to set guidelines and establish requirements regarding design and construction of municipal infrastructure within Wheatland County. Its objective is to ensure that all municipal infrastructure work in Wheatland County is constructed to a consistent, sustainable standard. Construction of municipal infrastructure must adhere to these standards.

The County retains the ability to refer to other applicable regional municipality Design Guidelines, Standards and Policies where the County deems it appropriate on a case by case basis.

1100 SURVEY CONTROL MARKERS AND LEGAL PINS

1101 EXISTING CONTROL

.1 The Developer or their Consultant shall make every effort to protect existing markers.

.2 Markers which are destroyed or disturbed shall be replaced by the Developer at their sole expense.

1102 LEGAL POSTS

.1 Legal posts shall be placed subsequent to the installation of all utilities.

.2 All legal posts in the subdivision area shall be located within 60 days prior to application for Final Acceptance of the surface improvements.

.3 The Developer shall instruct the legal surveying consultant to replace any missing or disturbed posts as required by the Wheatland County Representative. All costs are to be borne by the Developer.

2000 ROADS

The road design guidelines herein generally follow the most recent editions of Transportation Association of Canada (*TAC*) (*Various Guidelines*) and Alberta Transportation (*AT*) Highway Geometric Design Guide. It is the Developer's responsibility to ensure that the design, construction and performance of all infrastructure constructed under the Development Agreement or Access and Work Agreement meets or exceeds these standards/guidelines. Good engineering practice and design is required for all road construction situations.

The County may consider alternate road design variations from this section to accommodate unique site circumstances, provided that public safety and the County are not at risk. Any and all variations are to be brought to the County's attention and requested on a case by case basis.

The applicant shall enter into an "Access and Work Agreement" with the County to perform the road construction.

Applications must be submitted in writing with applicable design drawings to the Manager of Transportation and Utilities for road construction on statutory local road allowances and shall be subject to approval by the Manager of Transportation and Utilities. For Provincial roads applications must also be submitted to the Ministry of Transportation and shall be subject to approval by the Ministry and the County.

2100 TRAFFIC IMPACT ANALYSIS

2101 PURPOSE OF THE TRAFFIC IMPACT ASSESSMENT

The purpose of the Traffic Impact Assessment (*TIA*) is to review and evaluate operational conditions within the analyzed area and to assess impact of the proposed development and/or changes to the transportation network.

2102 EXTENT OF THE ANALYSIS

2102.1 STUDY AREA

The study area will be defined by the County on a case by case basis and will include area adjacent to the proposed development. This may involve all the proposed access points as well as selected intersections within the study area designated by the Wheatland County Representative. This includes intersections external as well as internal to the development.

2102.2 ANALYZED HORIZONS

The analysis should be carried out for:

(i) Current conditions using the current traffic volumes;

(ii) Opening day – showing conditions at the opening day; and

(iii) 5, 10, 15, and 25 year horizons or horizons as determined by the Wheatland County Representative.

2200 GENERAL

2201 Individual street classification is to be based on functional use as shown in Table 1 and verified by Wheatland County Engineering.

2202 The Developer and the Developer's Consultant are responsible to ensure that the infrastructure is designed and constructed to achieve design life expectations consistent with good design and construction practice.

2300 STREET CLASSIFICATION

Table 1 indicates the minimum required road cross sections for each street classification.

TABLE 1

Classification	Description	Min Granular Base Course Thickness (mm)	Min Granular Sub-base Course Thickness (mm)	Min Asphalt Pavement Thickness (mm)	Road width Lip of Gutter to Lip of Gutter (m)	ROW Width (m)
UL	Urban Lane	50	200	50 Mix B	7	7
UIC	Urban Industrial Commercial	150	250	60 Mix B 70 Mix A	9	19
UR	Urban Residential	100	200	40 Mix B 50 Mix A	11	16
URC	Urban Residential Collector	100	200	60 Mix B 70 Mix A	12	20
UPC	Urban Primary Collector	150	250	60 Mix B 70 Mix A	14	27

* Standard Road Sections Provided

*. Final ROW shall be dependent upon the requirement for noise abatement.

2400 VERTICAL ALIGNMENT

2401 GRADE

.1 The minimum grade shall be 0.6% along all gutters, 1.0% around curb returns and 0.8% on lanes.

.2 The maximum grade shall be 7.0%.

.3 A maximum gradient of 2% for a distance of 30 m from the curb return for all roadways connecting to any intersection.

.4 All roads shall be crowned or shall have a crossfall of between 2 and 4%.

2402 VERTICAL CURVES

.1 All vertical curves shall be designed to meet the more stringent of TAC or AT guidelines/standards.

2500 HORIZONTAL ALIGNMENT

2501 CURVES

.1 The minimum degree of curvature of the centerline of the carriage way is dependent on the road classification and its design speed.

.2 All horizontal curves shall be designed to meet the more stringent of TAC or AT guidelines/standards.

2600 GENERAL REQUIREMENTS

2601 PAVEMENT STRUCTURE

.1 The Geotechnical Report for the proposed project shall be submitted to the Wheatland County Representative for review as part of the overall submission.

.2 The Geotechnical Report must include specific recommendations for pavement structure construction based on insitu conditions and projected traffic volume. The more conservative of the 20 year structure recommended by the Geotechnical Consultant and the structure shown in Table 1 shall be used.

.3 Table 1 indicates the minimum thicknesses of granular and asphaltic concrete materials required for each street classification.

.4 The Final Acceptance Certificate (*FAC*) for roads excluding surface course asphalt shall be issued, subject to all deficiencies being rectified, two years after the issuance of the Construction Completion Certificate (*CCC*) for roads.

.5 If an interim or temporary entrance is necessary to provide access to a new subdivision, cul-de-sac or other residential street the pavement structure must be designed to accommodate the projected traffic for the life of the facility.

2602 SIDEWALKS AND WALKWAYS

.1 Separate sidewalks shall be a minimum width of 1.5 m. Separate sidewalks shall be constructed where indicated on the standard road cross sections.

.2 Monolithic 1.5 m sidewalk and gutter with rolled curb shall be constructed where indicated on the standard road cross sections.

.3 Monolithic sidewalk and gutter with standard curb shall be constructed where indicated on the standard road cross sections.

.4 All Collector and Arterial streets shall have sidewalks on both sides except where the adjacent lands are industrial where sidewalk is then only required on one side. Local roads shall have sidewalks on both sides where the adjacent lands are commercial or high density residential, otherwise local roads shall have sidewalk on one side.

.5 Wheelchair ramps are to be used at all curbed intersections and shall be constructed monolithically or securely dowelled.

.6 All sidewalks shall be imprinted with the Contractor's stamp showing company name and year of construction. Frequency of stamps shall be one per residential block or every 200 m whichever is less.

.7 Sidewalks shall be imprinted with a "CC" to identify all Curb Cock locations.

.8 The design of the subdivision should consider pedestrian needs and allow for walkways through cul-de-sacs and other appropriate locations.

2603 CONCRETE CURB AND GUTTER

.1 Concrete curb and gutter shall be constructed on all streets in accordance with this standard.

.2 Standard curb and gutter shall be used on all collector (*minor and major*) and arterial roads. All roads fronting parks, PUL's, and walkways shall also require standard curb and gutter unless another means of preventing vehicular access onto these public lands is provided.

.3 Curb returns on residential street intersections shall be constructed with a minimum radius of 10.0 m.

.4 Curb returns in industrial/commercial areas shall be constructed with a minimum radius of 15.0 m to accommodate truck turning movements.

2604 DRIVEWAYS

.1 Residential subdivision lot layout shall be such that driveways shall not access directly onto arterial roadways. In addition, no driveways shall be permitted direct access onto those major collector roads or portions thereof which have an estimated traffic volume of 4,000 vpd or greater.

.2 No driveways or any portion thereof shall be permitted to access an abutting road through a curb return area.

.3 For corner lots the driveway zone must be indicated for the street of lesser traffic only.

2605 BERMING, FENCING AND LANDSCAPING

.1 Consistent noise attenuation fencing shall be required on all lots that back or side onto arterial roads. Berming and fencing shall be required to separate residential developments from high volume arterial traffic. Roadways through residential areas which require berming and adjacent fencing include all arterial roads as well as adjacent highways.

.2 Residential development adjacent to arterial roadways, may require a Noise Impact Assessment (*NIA*) to be submitted during the development approval process. The NIA is to meet the intent of regional municipal policy and standards.

.3 Fencing proposals are to be reviewed for acceptance by the County. Fencing along arterial roads and utility lots shall be of a close boarded type and extend to ground level. Fencing is required along parks, schools and other public open space and shall be 1.5 m high. All fences shall be constructed on private property.

2606 CUL-DE-SACS

.1 The normal maximum length of a cul-de-sac is 120 m from the street curb line to the start of the bulb. Cul-de-sacs in excess of 120 m and less than 170 m will require an additional hydrant. Water main looping will be required for cul-de-sacs in excess of 120m. Where cul-de-sacs in excess of 170 m are proposed, provision must be made for a 6.0 m wide PUL for emergency vehicle access and water service looping.

.2 Cul-de-sacs with steep grades are to be avoided. If cul-de-sacs cannot be graded to drain towards the intersection then an outlet for the overland flow must be provided by way of a PUL.

.3 The minimum radius of cul-de-sac bulbs is 10.5m to lip of gutter for residential and 14.75m for all others.

.4 Cul-de-sac road surface is to be crowned except the bulb portion which may be crossfall.

2607 INTERSECTIONS

Intersections include the crossing of two public roadways or the connection of a public access to a roadway.

.1 The minimum angle of intersection for two roadways shall be 75°.

.2 Intersection design is to meet the more stringent of AT and TAC guidelines/standards.

.3 Acceptance of intersection design, driveway locations and fencing shall be subject to review of available sight distances and other safety considerations. Tapering of berms at intersections may be required to provide for the necessary sight distances. Acceptance shall be granted on a case by case basis.

.4 The Developer shall provide confirmation that sight distances, and horizontal and vertical visibility constraints at the access to arterial roadways, Range Roads and Township Roads meet the applicable stopping sight distances.

.5 Minimum centerline to centerline spacing of intersections shall be 60 m along local and collector roadways. Under normal circumstances (*i.e., on the 1.6 km or 3.2 km sections of grid roads*) access to arterial roads may be permitted as follows:

(i.) Signalized where warranted but potentially signalized intersections spaced and capacity designed for minimum arterial impact.

(ii.) Where traffic volumes or existing conditions make the above standards inappropriate the more stringent of AT and TAC guidelines/standards are to be applied.

.6 At the intersection of arterial roads and where the traffic volume at entrance roads indicates a need for acceleration/deceleration turning lanes the Developer shall provide an additional 3.7 m for widening of the arterial ROW.

.7 Standard 6m x 6m corner cutoffs will be required at all intersections unless otherwise directed by the County.

2608 LANEWAYS

.1 All laneways shall be a minimum of 7.0 m in width.

.2 If paved, laneways shall be paved over their full width.

.3 An inverted cross-section shall be used for laneway construction with a minimum longitudinal grade of 0.8%.

2609 TRAFFIC CONTROL AND STREET NAME SIGNS

.1 Traffic control and street name signs are to be as per regionally accepted standards unless otherwise stated in this section and as per the Rural Address Sign standard drawing.

.2 Street name signs at intersections shall consist of white lettering on a green metal plate. Lettering sizes shall be as follows:

(i.) Arterial Roadways: 250 mm (*10"*) on a 300 mm (*12"*) blade.

(ii.) Major Collector Roadways: 250 mm (*10"*) on a 300 mm (*12"*) blade.

(iii.) Minor Collector and Local Roadways: 100 mm (*4"*) on a 150 mm (*6"*) blade.

.3 100 mm (*4"*) white address numbering on a green metal plate will be required on all cul-de-sacs in addition to the street name signage.

.4 Developers may be permitted to install additional decorative street name signage or signage support when adequate maintenance funding provisions have been approved by the Wheatland County Representative.

2700 ROADWAY LIGHTING

2701 DESIGN CRITERIA

.1 The illumination of roadways in urban areas shall be designed to the TAC Guide for the Design of Roadway Lighting.

3000 SANITARY SEWER SYSTEM

3100 SYSTEM DESIGN

3101 GENERAL

The sanitary sewer system shall be of sufficient capacity to carry peak flows plus an inflow and infiltration allowance. The flows and factors outlined in the following sections shall be used in the design of sanitary sewer systems.

The Developer and the Developer's Consultant are responsible to meet the requirements of Alberta Environment & Parks when connecting to existing municipal systems or utilities.

The Developer and the Developer's Consultant are responsible to ensure that the infrastructure is designed and constructed to achieve design life expectations consistent with good design and construction practice.

3102 ESTIMATING AVERAGE SEWAGE FLOWS

.1 Residential: 300 L/person/day.

.2 Commercial/Industrial: Since these flows vary greatly with the type of development, each case must be considered on an individual basis. For preliminary planning purposes, 18.0 m^3/ha/day may be used for Commercial/Light Industrial.

.3 In determining residential flows a minimum of 3.0 persons per household shall be used.

3103 PEAKING FACTOR

.1 The peaking factor for residential development shall be calculated using the Harmon Formula. The minimum peaking factor shall be 4.0. Peaking Factor = $1 + (14 / (4 + (P/1000)^{0.5}))$, where P = the design contributing population in thousands.

.2 The peaking factor must reflect the projected population of the subdivision being designed.

.3 The peaking factor for commercial/industrial development varies greatly with the type of development. Each case must be considered on an individual basis.

3104 ESTIMATING EXTRANEOUS FLOW ALLOWANCES

.1 A general infiltration allowance of 0.28 L/sec/ha shall be added to the above flow.

.2 In addition, a separate allowance of 0.4 L/sec shall be added for each manhole located in a street sag with some degree of water inflow control in place.

3105 PIPE SIZING

3105.1 MINIMUM PIPE SIZE:

(i.) **Commercial / Industrial / Institutional:** 250 mm

(ii.) **Residential**: 200 mm (*150mm may be permitted on request for sewers servicing 6 or less units*)

3105.2 PIPE SIZING SHALL BE DETERMINED BY UTILIZING THE MANNING'S FORMULA USING A MINIMUM "N" VALUE (*ROUGHNESS COEFFICIENT*) OF 0.013.

$$Q = \frac{AR^{2/3}S^{1/2}}{n}$$

With calculation of the estimated design flow from the Manning's formula the pipe capacity shall then be determined with the following formula:

$$\text{Required Sewer Capacity} = \frac{\text{Estimated Design Flow}}{0.86}$$

3105.3 MINIMUM FLOW VELOCITY

0.60 m/sec. Maximum flow velocity = 3.0 m/sec. Minimum flow velocity in first upstream leg to be 0.90 m/sec.

3106 WEEPING TILES (FOUNDATION DRAINS)

.1 For any development (*residential, commercial, industrial, etc.*), weeping tiles, roof leaders (*downspouts*), sump pumps and similar appurtenances that handle storm water or ground water are not permitted to discharge into sanitary sewers.

3107 SANITARY SEWER MAIN ALIGNMENTS AND LOCATIONS

.1 Standard road sections provide line assignments for mains. A reduction from 3.0 m to 2.5 m separation distance between water and sanitary sewer mains may be considered upon request.

.2 Connection manholes and service mains to property line are required for a multi-family site as part of the overall subdivision site servicing. The Developer's Consultant must address the size and depth requirements of the service stub to ensure all of the multi-family lot can be adequately serviced.

.3 Mains shall be at a depth adequate to provide a minimum 2.5 m cover for silt and clay soils and 2.8m cover for granular soils from finished grade to top of pipe and the required minimum depth of cover over service connections. Insulation will be required for any main that is installed with less than the minimum cover.

.4 Curved sewers shall be permitted with the following restrictions:

(i.) The curve shall run parallel to the curb or street centerline.

(ii.) The minimum grade for sewers on a curve shall be 50% greater than the minimum grade required for a straight run of sewer.

(iii.) Manholes shall be located at the beginning and end of each curve. Joint deflection shall not exceed pipe manufacturers' specifications.

.5 At water main crossings of sanitary and storm sewers, the following shall apply:

(i.) Under normal conditions, water mains shall cross above sewers with a sufficient vertical separation to allow for proper bedding and structural support of the water and sewer mains.

(ii.) Where it is necessary for the water main to cross below the sewer, the water main shall be protected by providing:

a.) A vertical separation of at least 0.5 m from water main crown to sewer invert;

b.) Structural support of the sewer to prevent excessive joint deflection and settling; and

c.) A centering of the length of water main at the point of crossing so that the joints are equidistant from the sewer.

3108 MANHOLES

.1 The maximum spacing between manholes shall be 185 m. Lesser spacing distance is encouraged for maintenance purposes.

.2 Manholes are also required at all transitions in size, grade, or direction, and at junctions and the ends of mains. Change in flow direction shall not exceed 90 degrees. They should be located to avoid driveway conflicts.

.3 At manholes where pipe size changes occur, the crowns (*obverts*) of the incoming mains shall be designed to match or be higher than the outgoing main. This requirement could be relaxed if a hydraulic flow analysis proves flows are not negatively impacted.

.4 Inverts in manholes shall have a minimum 30 mm drop for straight run sewer manholes. At changes in direction, manholes shall have at least 60 mm fall across the manhole in the direction of flow from inlet to outlet elevation and 150mm for bends greater than 90^{o} if permitted by the Wheatland County Representative. The intention is to maintain the HGL considering entrance and exit losses such that the above minimums shall be increased as necessary.

.5 Drop sections are required for invert grade differences greater than 300 mm in sanitary sewer manholes. For 200 mm and 250 mm mains, internal drops may be used. Benching is required for invert grade differences 300 mm or less.

3109 SERVICE CONNECTIONS

.1 Each lot or multi-family unit shall have its own separate sanitary service connection.

.2 The minimum size of a sanitary sewer service connection shall be 100 mm inside diameter.

.3 Non-residential and multi-family service connections shall be sized according to anticipated user requirements. These service connections would normally be installed at the time that the subdivision is developed. Commercial/Industrial service connections may be deferred until the lots develop provided there will be no disturbance to the roadway while making the connection to the sewer main.

.4 The minimum grade on the service line shall be 2.0%.

.5 In the case of single family lots, the minimum depth of cover shall be 2.6 m to the top of pipe from finished grade at a point 0.15 m from the back (*house side*) of the property easement/right-of-way.

.6 For non-residential and multi-family service connections, the Developer's Consultant must address the depth requirements for servicing of these lots in the establishment of the design depth for the sanitary sewer main on the abutting street.

.7 Services shall be located such that they do not conflict with driveway locations.

.8 In-line Tees or Wyes are required for all residential service connections.

.9 Services require an inspection chamber at property line.

.10 Commercial/industrial connections 200 mm or larger require a manhole connection. Where a manhole connection is provided an inspection chamber is not required.

4000 WATER DISTRIBUTION SYSTEM

4100 GENERAL

The Developer and the Developer's Consultant are responsible to meet the requirements of Alberta Environment & Parks when connecting to existing municipal systems or utilities.

The Developer and the Developer's Consultant are responsible to ensure that the infrastructure is designed and constructed to achieve design life expectations consistent with good design and construction practice.

4200 SYSTEM DESIGN

4201 HYDRAULIC NETWORK ANALYSIS

.1 The Developer shall perform hydraulic network analyses for all developments.

.2 The criteria for network analysis shall be as follows:

- .1 The normal operating range for residential pressure shall be between 350 kPa to 700 kPa with a maximum velocity of 3.0 m/sec.
- .2 Design population shall be the ultimate population for the area under construction.
- .3 Design consumption:

  Average Day Minimum Demand ....360 L/person/day

  Maximum Day Demand..........................720 L/person/day

  Peak Hour Demand ....1,440 L/person/day
- .4 The maximum value of "C" in the Hazen- Williams formula shall be 120 regardless of pipe material.
- .5 An analysis shall be made for peak hour demand and the mains shall be sized such that there shall be a minimum residual pressure of 350 kPa at ground level at any node in the network.
- .6 Analysis to be performed on system for maximum day demand plus a fire flow of:
  - 50 L/s fire flow for country residential
  - 100 L/s fire flow for residential
  - 166 L/s fire flow for multi-family
  - 250 L/s for all other high density, industrial, commercial or institutional

  The minimum residual pressure at any node in the system shall be 140 kPa at ground level under this situation.
- .7 Fire flow conditions shall also be analyzed using the criteria contained in the most recent edition of "Water Supply For Public Fire Protection, A Guide to Recommended Practice" as published by Fire Underwriters Survey. The analysis must take into consideration the various factors which may impact on the fire flow requirements.
- .8 In commercial/industrial areas, a separate analysis shall also be made to determine what system configurations and sizes would be required to provide direct flow to sprinkler systems in combination with hydrant flows in accordance with National Fire Protection and Fire Underwriter's Survey standards.

.9 All calculations, schematic diagrams, computer printouts, etc. shall be submitted.

4202 WATER MAINS

.1 In residential, commercial and industrial subdivisions the water main alignments and hydrant locations shall be as per the standard road cross sections.

.2 A reduction from 3.0 m to 2.5 m separation distance between water and sanitary sewer mains may be considered.

.3 The installation of a water main service to property line for a multi-family site development would normally be completed at the time of initial subdivision development.

.4 The water distribution system in new subdivisions shall be looped. For the initial purely residential stages of a large development area the Wheatland County Representative, at its sole discretion, may temporarily waive this requirement provided that the developer can demonstrate that the necessary fire flows can be delivered via the single water feed. In any event, a maximum of 50 lots may be serviced temporarily without looping of the system. Looping must be provided within one year of temporarily servicing without looping.

In the case of residential cul-de-sacs, distribution lines must all be looped except those serving single cul-de-sacs of less than 120 m as measured from the street curb line to the start of the bulb. In the case of industrial/commercial subdivisions, all distribution mains must be looped.

.5 At street intersections, a minimum clearance of 1.5 m horizontally shall be maintained between water mains and any catch basins or storm manholes.

.6 Mains shall be at a depth adequate to provide a minimum 3.0 m cover in silt and clay soils and 3.3 m cover in granular soils from finished grade to top of pipe and the same depth of cover over service line goosenecks (*in the case of single family dwelling services*).

.7 The minimum diameter for distribution mains shall be 150 mm for a residential development unless one or more hydrants are located on the line in which case the minimum diameter shall be 200 mm. For commercial/industrial development, the minimum water main size shall be 300 mm.

.8 At water main crossings of sanitary and storm sewers, the following shall apply:

.1 Under normal conditions, water mains shall cross above sewers with a sufficient vertical separation to allow for proper bedding and structural support of water and sewer mains.

.2 Where it is necessary for the water main to cross below the sewer, the water main shall be protected by providing:

a.) A vertical separation of at least 0.5 m from water main crown to sewer invert;

b.) Structural support of the sewer to prevent excessive joint deflection and settling; or

c.) A centering of the length of water main at the point of crossing so that the joints are equidistant from the sewer.

.9 In the vicinity where a change in elevation greater than two pipe diameters between the obvert of the lower pipe and the invert of the upper pipe where no service line exists, a blow-off or similar device must be added for the removal of trapped air.

.10 Any water main installed made of PVC, HDPE or similar non-conductive material is to have tracer wire installed. The tracer wire shall have connection points exposed at every opportunity (*all valves, blow-offs and hydrants*).

.11 Tracer wire used must be a minimum of 14 gauge coated copper wire complete with sacrificial 5 lb anodes spaced every 1000 l/m.

4203 HYDRANTS

.1 Maximum allowable spacing between fire hydrants shall be 150 m in single family residential areas and 90 m in multiple family residential, school or industrial/commercial areas. Variances may be considered if it can be demonstrated that the alternative hydrant location provides more efficient connection and response time. Wheatland County Fire and Disaster Services should be included for input into any variance request.

.2 They shall be located at the beginning of the curve of the curb return at the corners of intersections or at the extension of property lines.

.3 In cul-de-sacs of 75 m in length or less, the hydrant shall be installed at or near the intersection of the intersecting street.

.4 Hydrants are to be set to ensure that the pumper port faces the street. If non-standard alignment locations are accepted for either the main or the hydrant, the hydrant valve must not be installed directly in front of the pumper port.

4204 VALVES

.1 Distribution main valves shall be located as follows:

- (i.) On the projection of property lines at mid-block, at the beginning of curb return at road intersections.

.2 Distribution main valves shall be located such that in the event of a shutdown:

- (i.) No more than two hydrants are taken out of service,
- (ii.) No more than 25 single family units are involved in a shutdown.

.3 Maximum length of a dead end line in a residential neighbourhood is 120 m. A blow off valve must be installed at the end of dead end line. Blow off valves need to be sized to achieve a minimum flushing flow of 0.6 m/sec.

.4 Valves on hydrant leads are to be located in the boulevard area. All hydrants must be separated from the distribution system by a valve. Valves shall be spaced far enough away from the hydrant body to allow for easy operation.

.5 Valves shall be the same size as the main they are installed on.

4205 SERVICE CONNECTIONS

.1 Each lot or multi-family unit shall have its own separate water service connection. Any sprinkler dwellings are to have a minimum 38mm service and be sized as per the demands.

Services to single family dwellings or multi-family units shall be a minimum 20 mm diameter unless the length of the service, measured from the main to the property line or unit, is greater than 20 m in which case 25 mm diameter shall be used.

Multi-family and industrial/commercial service connections shall be sized according to anticipated user requirements. These service connections would normally be installed at the time that the subdivision is being developed. Commercial/Industrial service connections may be deferred until the individual lots develop provided there will not be a disturbance to the roadway while making the connection to the water main. A shut-off valve must be installed at property line when the lot is serviced.

.2 In the case of single family lots, the minimum depth of cover shall be 3.0 m for silt and clay soils and 3.3m for granular soils from finished grade over a vertical gooseneck and to the top of pipe at a point 0.15 m from the back of (*house side*) of the easement required along the front of all lots.

.3 Curb stops locations shall be located such that they do not conflict with driveway locations or sidewalks.

.4 Parks may require a water service. The size, type and requirement will be determined in consultation with the Wheatland County Representative.

5000 STORMWATER MANAGEMENT SYSTEM

5100 SYSTEM DESIGN

5101 GENERAL

.1 The concept of a major and minor storm drainage system has three purposes:

.1 The control of storm water to minimize inconvenience or disruption of activity as a result of runoff from more frequent but less intense storms, and

.2 Control of storm water runoff to prevent or minimize damage to property, physical injury and loss of life which may occur during or after an infrequent or unusual storm; and

.3 Provide improved water quality by filtering contaminants prior to entering receiving downstream water courses.

.2 When the minor system capacity is exceeded the major system must provide a continuous overland flow route for runoff water to follow. Generally major system routing shall utilize roadways and open channels with carefully designed and controlled lot grading and building elevations.

.3 Storm sewers shall be designed as a separate sewer system. Effluent from sanitary sewers or any potentially contaminated drainage from industrial, agricultural, or commercial operations shall not be discharged to storm sewers.

.4 The Developer and their Engineering Consultant must adhere to the guidelines presented in the latest edition of the publication "Stormwater Management Guidelines for the Province of Alberta" prepared by AEP.

5102 MINOR SYSTEM

5102.1 DESIGN CRITERIA

.1 The Minor System must be designed to accommodate the runoff generated by a 1:5 year storm event.

.2 The Rational Method. For most developments, the Rational Method is not an acceptable form of stormwater analysis in Wheatland County. However, in some cases for single lot developments less than 2.0 ha exceptions may be provided. Such exceptions will require written approval obtained from the Wheatland County Representative. All other cases will require the use of computer modeling.

.3 Computer modelling shall be required by the County for the design of stormwater systems for all areas not specifically approved in the previous section.

5102.2 DESIGN CRITERIA

.1 Minimum Pipe Size:

Storm Sewer ..... 300 mm

Catch Basin Lead..... 250 mm

Double Catch Basin Lead .. 300 mm

.2 Pipe sizing shall be determined by utilizing the Manning's Formula using a minimum "n" value of 0.013.

.3 Minimum flow velocity = 0.60 m/sec. Maximum flow velocity = 3.0 m/sec.

.4 The minimum grade of catch basin leads shall not be less than 1.0%.

.5 Minimum slopes determined by velocity shall be increased by 50% on all curves.

5102.3 STORM SEWER MAIN ALIGNMENTS AND LOCATIONS

.1 Alignments are provided in the standard road cross sections.

.2 The installation of a main into a multi-family site development would normally be completed at the time the site develops. However, the Developer's Consultant must address the depth requirements for servicing the site in the establishment of the design depth for the main located on the abutting street.

.3 Storm sewer service must be provided to all commercial and industrial lots.

.4 Storm sewers must be located at least 3.0 m horizontally from any water main.

.5 PUL widths shall be a minimum of 4.0 m for a single utility and 6.0 m for one containing two utilities. A 1.0 m easement is required on the lots on each side of a PUL.

.6 Mains shall have a minimum depth of cover of 1.2 m to top of pipe.

.7 Curved sewers shall be permitted with the following restrictions:

a.) The curve shall run parallel to the curb or street centreline.

b.) The minimum grade for sewers on a curve shall be 50% greater than the minimum grade required for a straight run of sewer.

c.) Manholes shall be located at the beginning and end of each curve and intermediate locations as required.

.8 At water main crossings of sanitary and storm sewers, the following shall apply:

a.) Under normal conditions, water mains shall cross above sewers with a sufficient vertical separation to allow for proper bedding and structural support of the water and sewer mains.

b.) Where it is necessary for the water main to cross below the sewer, the water main shall be protected by providing:

- A vertical separation of at least 0.5 m from water main crown to sewer invert;
- Structural support of the sewer to prevent excessive joint deflection and settling; or
- A centering of the length of water main at the point of crossing so that the joints are equidistant from the sewer.

5102.4 MANHOLES

.1 The maximum spacing between manholes shall be 185 m.

.2 Manholes are also required at all transitions in size, grade, or direction, and at junctions and the ends of mains. They should be located to avoid driveway conflicts.

.3 At manholes where size changes occur, the crowns (*obverts*) of the mains shall be designed to match.

.4 Inverts in manholes shall have a minimum 30 mm drop for straight run sewer manholes. At changes in direction, manholes shall have at least 60 mm fall across the manhole in the direction of flow from inlet to outlet elevation and 150mm for bends greater than 90o. The intention is to maintain the HGL considering entrance and exit losses such that the above minimums shall be increased as necessary.

5102.5 CATCH BASINS

.1 See standard drawings for catch basin types.

.2 The maximum run between catch basins shall be 150 m with minimum grades.

.3 Spacing and capacity of catch basins shall be such that ponding shall not occur during a 1:5 year storm.

.4 The minimum sump depth in catch basins shall be 600 mm.

.5 Catch basins shall be installed to intercept all overland flows, including back lanes, prior to crossing walkways. At curb returns, catch basins shall be installed to intercept runoff on the uphill side of cross walks.

.6 Concrete swales crossing roadways will be permitted with written approval of the Wheatland County Representative.

5102.6 CATCH BASIN LEADS

.1 The minimum size of catch basin leads shall be 250 mm inside diameter.

.2 The maximum length of a catch basin lead shall be 30 m. A catch basin manhole shall be required at the upper end if the lead exceeds 30 m.

.3 The minimum grade on a catch basin lead shall be 1.0%.

.4 Minimum depth of cover shall be 1.2 m to top of pipe.

.5 All leads shall be connected to a main line manhole or a catch basin manhole.

5102.7 STORM SEWER SERVICE CONNECTIONS

.1 Single family Residential Service connections shall be minimum 150 mm inside diameter.

.2 Medium/high density residential and non-residential site service connections shall be sized according to anticipated site requirements.

.3 Services shall be located such that they do not conflict with driveway locations.

5103 MAJOR SYSTEM AND STORM WATER MANAGEMENT FACILITIES (*SWMF*)

5103.1 GENERAL

.1 The overall major drainage system for the Urban Services Area must be designed to provide continuous overland flow routes with minimum depths of ponding in roadway sags and to provide overflow routes at all SWMF. The development of the major drainage system framework shall be a key component of the Master Drainage Plan to be developed by the Developer's Engineering Consultant for new drainage basins (*watersheds*).

.2 The major system shall accommodate a 1:100 year storm.

5103.2 LOT GRADING

.1 Carefully designed and controlled lot grading is an important component of the Major System.

.2 Lots shall be designed to drain from back to front except under extreme cases where the Developer can satisfy the Wheatland County Representative that back to front drainage is not technically feasible. If an alternate system is required it must be designed so that surface water crosses the fewest lots possible in its path to the street. No more than two lots shall be crossed. In extreme cases the Wheatland County Representative, may permit more than two lots to be crossed provided a concrete drainage swale and easement are established. The potential problem areas shall be identified in the Design Brief.

.3 Minimum and maximum slopes on landscaped areas to be 2% and 10% respectively. An initial minimum grade of 10% over a distance of 1.5 m is to be provided around all buildings. Driveway slopes must be no less than 2% and no greater than 8%.

5103.3 STORM WATER MANAGEMENT FACILITIES

.1 Stormwater Management Facilities shall be as per AEP "Stormwater Management Guidelines for the Province of Alberta.

WHEATLAND COUNTY

RURAL SERVICE AREA DESIGN STANDARDS

OCTOBER 2016

WHEATLAND COUNTY

Where There's Room to Grow


WHEATLAND COUNTY
Where There's Room to Grow

CONTENTS

WHEATLAND COUNTY

RURAL SERVICE AREA STANDARDS

JULY 2016

1000 GENERAL

These standards are provided to set guidelines and establish requirements regarding design and construction of municipal infrastructure within Wheatland County. Its objective is to ensure that all municipal infrastructure work in Wheatland County is constructed to a consistent, sustainable standard. Construction of municipal infrastructure must adhere to these standards.

The County retains the ability to refer to other applicable regional municipality Design Guidelines, Standards and Policies where the County deems it appropriate on a case by case basis.

1100 SURVEY CONTROL MARKERS AND LEGAL PINS

1101 Existing Control

.1 The Developer or their Consultant shall make every effort to protect existing markers.

.2 Markers which are destroyed or disturbed shall be replaced by the Developer at their sole expense.

1102 Legal Posts

.1 Legal posts shall be placed subsequent to the installation of all utilities.

.2 All legal posts in the subdivision area shall be located within 60 days prior to application for Final Acceptance of the surface improvements.

.3 The Developer shall instruct the legal surveying consultant to replace any missing or disturbed posts as required by the Wheatland County Representative. All costs are to be borne by the Developer.

2000 RURAL TRANSPORTATION

LIST OF TABLES

LIST OF DRAWINGS

GLOSSARY

AADT	Average Annual Daily Traffic
ACP	Asphalt Concrete Pavement
AT	Alberta Transportation
ATR	Automatic Traffic Recorder
CBR	California Bearing Ratio
CCC	Construction Completion Certificate
EB	Eastbound
ER	Environmental Reserve
FWD	Falling Weight Deflectometer
Hwy	Highway
ICU	Intersection Capacity Utilization
Int	Intersection
LOS	Level of Service
LT	Left Turn Lane
MR	Municipal Reserve
NB	Northbound
PUL	Public Utility Lot
RAU	Rural Arterial Undivided
RLU	Rural Local Undivided
ROW	Right of Way
RPR	Real Property Report
RT	Right Turn Lane
SB	Southbound
SPD	Standard Proctor Density
TH	Through Lane
TIA	Traffic Impact Assessment
URW	Utility Right of Way
v/c	Volume to Capacity Ratio
WB	Westbound

2000 Roadway Requirements and Standards

2100 Design Classifications and Criteria

Wheatland County recognizes four (4) general road classifications for use within the County, as identified in Table 2000-1 below, with specific sub-classifications identified for typically encountered municipal improvement work. General design criteria for each road classification is referenced in the following subsections with more detailed requirements for road, geometric, pavement design and utility requirements in Sections 2200, 2300, 2400, and 2500, respectively.

Table 2000-1: Road classifications and Sub-classifications

Classification	Sub-Classifications
Internal Subdivision Road	Hamlet Residential Road (Rural Standard) Condominium Road (Private) Internal Subdivision Road: • Less than 4 lots • 10 lots or less • More than 10 lots
Collector (RLU)	Industrial / Commercial Road Service Road
Major Collector (RLU)	Local Road (Gravel Standard)
Arterial (RAU)	Local Road (Paved Standard)
Provincial Highway *(Not within the County's jurisdiction – Developer shall apply to Alberta Transportation (AT) and refer to AT's Roadside Development Permit for any proposed work on the highway network.)*	

2101 Local Roads

Local Roads provide access to land, with traffic movement as a secondary consideration. Typically, Local Roads connect with other Local Roads and / or Collectors. The Local Road classification describes roadways which experience relatively low volumes of daily traffic that is predominantly composed of passenger cars and light to medium trucks with the occasional heavy truck.

The County recognizes four (4) sub-classifications of Local Roads, identified in the following sections, which are typically used for municipal improvement works. Any proposed modifications to the sub-classifications shall be prepared by a professional engineer and shall be considered on a case-by-case basis by the County.

2101.1 Residential Road (Rural Standard)

The Residential Road (Rural Standard) sub-classification provides access to land in rural residential settings. This type of road may also incorporate stormwater drainage, water and wastewater infrastructure, and / or other utilities within its cross-section, as required.

The design speed for a Residential Road (Rural Standard) is 60 km/h with a maximum posted speed limit of 50 km/h or lower.

The basic ROW for a Residential Road (Rural Standard) is 30 m with ditches incorporated into the cross-section.

A typical cross-section and general design guidelines for Residential Roads (Rural Standard) are presented in Drawings A-1.1 to A-1.5 included in Schedule A-2: Standard Road Drawings.

2101.2 Condominium Road

A Condominium Road is designed to be privately-owned and maintained by a condominium association in perpetuity; however, essential services and emergency response vehicles, such as fire and ambulance, require access to such developments with little or no disruption. As such, the design of Condominium Roads shall be in accordance with the requirements for Residential Roads (Urban or Rural Standard); alternate designs may be considered by the County, if and as necessary.

2101.3 Internal Subdivision Road

The Internal Subdivision Road sub-classification provides access to country residential parcels. The basic design for an Internal Subdivision Road provides a paved 7.6 m road surface with 4:1 sideslopes and 3 m ditches within a 30 m basic ROW.

The design speed for an Internal Subdivision Road is 60 km/h with a maximum posted speed limit of 50 km/h or lower.

A typical cross-section and general design guidelines for Internal Subdivision Roads are presented in Drawing Figure A-2 – Internal Subdivision, included in Schedule A-2: Standard Road Drawings.

2101.4 Low Volume Road

The Low Volume Road sub-classification provides access to land in rural settings and provides links between various road classifications. Low volume roads shall be considered where a maximum of four (4) residential lots and/or dwelling units are proposed, traffic generation is not anticipated to exceed 50 VPD and future development is restricted by topography or other factors. This type of road may also incorporate stormwater drainage, water and wastewater infrastructure, and / or other utilities, as required.

The design speed for a Low Volume Road is 60 km/h with a maximum posted speed limit of 50 km/h or lower.

Right-of-way and cross-section requirements for the Low Volume Road sub-classification may vary and are subject to the discretion of the County.

2102 Collectors (RCU)

Collectors provide access to land and provide a higher level of traffic movement than local roads. Collector roadways collect traffic from local roads and channel it to higher classified roadways. The Collector classification applies for roadways with moderate volumes of daily traffic, composed of passenger cars, and light, medium and heavy trucks.

The County recognizes two (2) sub-classifications of Collectors, identified in the following sections, which are typically used for municipal improvement works. Any proposed modifications to the sub-classifications shall be prepared by a professional engineer and shall be considered on a case-by-case basis by the County.

2102.1 Service Road

The Service Road sub-classification provides local access to properties (residential, business, or otherwise) adjacent to a road designation with access limitations such as an arterial, expressway or freeway.

The design speed for a Service Road is 60 km/h with a maximum posted speed limit of 50 km/h or less.

A typical cross-section and general design guidelines for Service Roads are presented in Drawing A-4 included in Schedule A-2: Standard Road Drawings.

2102.2 Industrial / Commercial Road

The Industrial / Commercial Road sub-classification provides local access to industrial businesses with a design that accommodates a higher percentage of truck traffic compared to other road designations. This roadway designation provides a wider roadway top width of 9.0 m within a 30 m ROW, greater horizontal curve parameters, increased surfacing structure, and greater stopping sight distances for larger vehicles.

The design speed for an Industrial / Commercial Road is 60 km/h with a maximum posted speed limit of 50 km/h or less.

A typical cross-section and general design guidelines for Industrial / Commercial Roads are presented in Drawing A-5, included in Schedule A-2: Standard Road Drawings.

2103 Major Collectors (RLU)

Major Collectors provide access to land and provide a higher level of traffic movement than Collector roadways. Major Collectors collect traffic from Collectors and Local Roads and channel it to higher classified roadways. The Major Collector classification applies for roadways with higher volumes of daily traffic, composed of passenger cars, and light, medium and heavy trucks.

The County recognizes two (2) sub-classifications of Major Collectors, identified in the following sections, which are typically used for municipal improvement works. Any proposed modifications to the sub-classifications presented below shall be prepared by a professional engineer and may be considered on a case-by-case basis by the County.

2103.1 Municipal Road (Gravel Standard)

The Road Allowance (Gravel Standard) sub-classification is a roadway within an existing government road allowance, whether it be new construction or re-construction of an existing road to current standards. The minimum basic ROW for this road designation is 20 – 30 m.

A Developer who constructs a road allowance extension to provide access to a municipal improvement is responsible for surfacing the road with gravel prior to acceptance by the County.

Construction within road allowances, either undeveloped or developed, shall be carried out in accordance with the County's standards as well as the conditions of approval for the municipal improvement. The Developer shall submit the detailed design and related drawings, prepared by a Professional Engineer, for Municipal approval. A Development Agreement, signed by the Developer, a letter of credit and proof of liability insurance is required prior to Municipal approval for construction within any road allowance.

The design speed for the Municipal Road (Gravel Standard) sub-classification is 90 km/h with a maximum posted speed limit of 80 km/h or less.

A typical cross-section and general design guidelines for the Municipal Road (Gravel Standard) designation are presented in Drawing A-6, included in Schedule A-2: Standard Road Drawings.

2104 Arterial Roads (RAU)

Any proposed construction or upgrades on an existing road to an arterial designation shall be considered on a case-by-case basis by the County. Proposed designs for arterial roads shall be prepared by a Professional Engineer and shall incorporate access management.

2104.1 Road Allowance (Paved Standard)

The Municipal Road (Paved Standard) sub-classification is a roadway within an existing government road allowance, whether it be new construction or re-construction of an existing road to current standards. The Municipal Road (Paved Standard) is typically constructed with a wider subgrade to support a paved surfacing structure (granular base course and asphalt concrete pavement). The minimum basic ROW for this road designation is 30 m.

A Developer who constructs a road allowance extension to provide access to a municipal improvement is responsible for surfacing the road in accordance with the proposed design prior to acceptance by the County.

Construction within road allowances, either undeveloped or developed, shall be carried out in accordance with the County's standards as well as the conditions of approval for the municipal improvement. The Developer shall submit the detailed design and related drawings, prepared by a Professional Engineer, for Municipal approval. A Development Agreement, signed by the Developer, a letter of credit and proof of liability insurance shall be required prior to Municipal approval for construction within any road allowance.

The design speed for the Municipal Road (Paved Standard) sub-classification is 110 km/h with a maximum posted speed limit of 100 km/h or less.

A typical cross-section and general design guidelines for the Municipal Road (Paved Standard) designation are presented in Drawing A-7, included in Schedule A-2: Standard Road Drawings.

2200 Road Design Guidelines

The following road design guidelines present the County's general requirements for proposed roadway design and construction projects. In addition to the requirements presented herein, the

most recent version of the following guidelines and supporting documents are to be used in preparation of road designs for the County:

(1) *Geometric Design Guide for Canadian Roads*, Transportation Association of Canada (TAC);

(2) *Highway Geometric Design Guide*, Alberta Transportation (AT);

(3) *Traffic Impact Assessment Guideline*, Alberta Transportation (AT);

(4) *Manual of Uniform Traffic Control Devices for Canada,* Transportation Association of Canada (TAC);

(5) *Rural Approach Standards Policy*, Wheatland County;

(6) *Roadside Design Guide*, Alberta Transportation (AT);

(7) *Standard Specifications for Highway Construction*, Alberta Transportation (AT).

The County may consider innovative design variations from the guidelines presented herein to accommodate site-specific variances, provided that public safety and the County are not at risk and that the Consulting Engineer provides sufficient reasoning and justification for any proposed variations.

2201 Traffic Impact Assessments

A Traffic Impact Assessment (TIA) is required for all proposed subdivision developments with ten (10) or more lots and for all proposed industrial / commercial developments. The County may also require a TIA for subdivision developments which propose to use existing Municipal roads or for developments with less than ten (10) lots at the County's discretion.

TIAs shall be prepared and authenticated by a professional engineer and shall be conducted in accordance with the requirements set forth in AT's *Traffic Impact Assessment Guideline*. All items required within this guideline shall be identified and provided as part of the County's requirements. Because this guideline cannot feasibly cover all situations which may arise, it is recommended that the Developer / Consulting Engineer contact the County to identify and determine site-specific components of the study. Some details, such as growth rates, shall be established on a case-by-case basis in conjunction with the County as they can vary depending upon the location of the proposed improvement.

Minimum requirements for intersection improvements shall be based on AT's *Highway Geometric Design Guide*. The intersection review and assessment shall include a detailed individual turning movement analysis The cost of any additional ROW required to accommodate intersection improvements is the sole responsibility of the Developer.

Trip generation rates shall be based on information included within the Institute of Transportation Engineers' (ITE's) *Trip Generation Tables*.

The minimum Level of Service (LOS) acceptable to the County is "C" in all rural areas. A lower LOS may be considered in urban or urban / rural fringe areas at the discretion of the County.

2202 Dedicated Road Widening and Additional ROW Requirements

As part of the land subdivision process outlined in Division 8, Section 661 and 662 of the *Municipal Government Act*, the County may require land to be provided for the purposes of future road widening and /or road upgrading. Compensation may not be provided to the Developer for such land nor for improvements (such as gates, fences, trees, shelterbelts, etc.) on such land.

The following items pertain to the County's requirements for dedicated road widening and additional ROW requirements:

(1) For proposed improvements of undeveloped road allowances, ROW for future road widening shall be taken adjacent to the road allowance unless the County agrees, in writing, that there is sufficient ROW available for future road improvements or the road has no likelihood of future improvements.

(2) Additional ROW may be required in areas where there are abnormal embankments, large fill / cut areas, or existing substandard road conditions. In these circumstances, the County shall endeavor to protect, at a minimum, the ROW required for minimum 4:1 sideslopes and 3:1 backslopes with a 3 m ditch bottom, as required.

(3) To accommodate future improvements to intersections, additional ROW may be required in the form of corner cut-offs. Table 2000-2 below outlines the minimum corner cut-off ROW requirements to be provided at intersections. Proposed intersection improvements with a Provincial highway shall adhere to Alberta Transportation's requirements and shall be approved by both the County and Alberta Transportation, as applicable.

Table 2000-2: Minimum Corner Cut-off Requirements at Intersections

Classification of Intersecting Roadways		Minimum Corner Cut-off Requirements
Arterial	Arterial	15 m x 15 m*
Arterial	Major Collector	8 m x 15 m*
Arterial	Collector	8 m x 15 m*
Major Collector	Major Collector	10 m x 10 m
Major Collector	Collector	6 m x 6 m
Collector	Collector	6 m x 6 m
Collector	Local	6 m x 6 m
Local	Local	6 m x 6 m
Urban	Urban	3 m x 3 m
Commercial Access	Arterial	6 m x 6 m

* In addition to provision of a 5.0 m auxiliary lane widening along the Arterial Road.

(4) Additional ROW may be required at bridge file locations to accommodate future replacement structures (bridge or culvert).

(5) Additional ROW may be required to accommodate a future service road for access to future development. The County may also require additional ROW to provide for future development and / or access improvements or re-alignment.

(6) Where additional ROW is required for road widening, it is preferable to acquire the additional ROW from both sides of the existing road ROW to reduce the impact to adjacent properties; in some circumstances, where the presence of utilities, physical restrictions, or other obstacles limit the ability to construct on both sides, it may be necessary to acquire land and widen or re-develop the road on one side of the existing road only.

(7) The Developer is required to provide a legal land survey for the municipal improvement, showing the location of the proposed road with respect to adjacent properties. The Developer is responsible to provide the additional land required for any encroachment of the proposed road onto the adjacent properties.

(8) The Developer is responsible for all expenses related to surveying and development of a road plan for the municipal improvement including movement of existing fences as well as all costs associated with legal survey and land titles registration.

2203 Setbacks

Table 2000-3 below identifies the minimum setback distances required for all proposed municipal improvements and developments.

Table 2000-3: Minimum Setback Distances

	Min. Setback Distance from Road Centreline	
	Local Roads and Collectors	**Major Collectors and Arterials**
Berm	20 m	25 m
Stormwater Pond	20 m	25 m
Dugout	20 m	25 m

Note: All measurements shall be taken from the outside toe of slope of the berm or berm for stormwater pond/dugout (where the sideslope of the berm intersects with the natural ground surface); berm sideslopes shall not be steeper than 3H:1V. If no berm exists, a minimum 6 meter to be added to the above setbacks.

2204 Intersections

The following criteria apply to roadway intersection designs for all proposed municipal improvements:

(1) The desirable angle of intersection for any two roadways shall be 90°. Alternate angles of intersection for some intersection, driveway, access and fencing locations may be accepted by the County subject to evidence of acceptable sight distances and other safety factors by the Consulting Engineer.

(2) The Consulting Engineer shall provide evidence that sight distances and horizontal / vertical visibility at all accesses, including driveways, along a road meet the applicable requirements for intersection stopping and approaching sight distance as outlined in TAC's *Geometric Design Guide for Canadian Roads*.

(3) The minimum spacing between any two intersections along local or collector roads shall be 150 m, measured from center of intersection to center of intersection. A lesser intersection spacing may be acceptable at the discretion of the County.

(4) Where existing or future traffic volumes warrant acceleration and / or deceleration lanes for a turning movement, the Developer shall provide an additional 5.0 m of ROW for road widening, as a minimum and at the County's discretion.

(5) Any proposed intersection with a provincial highway shall require an AT *Development Permit.*

Table 2000-4 below identifies the typical intersection geometric requirements. These requirements are also illustrated in Drawing A-8, included in Schedule A-2: Standard Road Drawings.

Table 2000-4: Geometric Requirements at Intersections

Geometric Component	Requirement
Approach Gradient	+2% or less*
Minimum Length of Vertical Curve	30 m or greater
Minimum "K" Value	7 (Crest Vertical Curve) 6 (Sag Vertical Curve)
Minimum Turning Radius	15 m**

* A maximum approach gradient of 3% may be acceptable at the discretion of the County.

** Larger turning radii shall be required for Industrial / Commercial Roads (to accommodate larger design vehicle), and for intersections between Municipal Road (Paved Standard) and Arterial Roads.

2205 Approaches

All approaches shall comply with the County's *Rural Approach Standards Policy* and the requirements contained herein. The following criteria apply to approaches along roadways for all proposed municipal improvements:

(1) All newly created parcels shall have a means of legal and physical access. The County shall evaluate the proposed design for every access to ensure that it is acceptable. The final location, configuration and construction of all proposed approaches shall be approved by the County.

(2) Upon subdivision of the land, existing accesses shall be removed and new accesses shall be provided from the proposed road.

(3) Access to Municipal Reserve (MR), Environmental Reserve (ER) or balance parcels shall be provided from the proposed new road.

(4) Only one (1) approach shall be allowed for each parcel / lot. Additional accesses must be approved by the County in writing.

(5) Approaches along a curve of the proposed new road are not permitted if the radius of the curve is less than 1200 m.

(6) The Consulting Engineer shall provide evidence that sight distances and horizontal / vertical visibility at all accesses, including driveways, along a road meet the applicable requirements for intersection stopping and approaching sight distances as outlined in TAC's *Geometric Design Guide for Canadian Roads*.

(7) There shall be no obstructions (e.g. gate, fence, control box, etc.) located on the approach within the road ROW.

(8) Any proposed changes to the existing ditch bottom shall be approved by the County.

(9) Approaches shall be constructed of the same material and with the same surfacing structure as the adjoining road.

(10) Any proposed intersection with a provincial highway shall require an AT approval in the form of a *Development Permit.*

(11) Approach construction shall be conducted in accordance with the County's road construction standard.

(12) All debris and / or excessive top soil in the ROW shall be disposed of at a location suitable to the County. All disturbed areas shall be returned to original grade, loamed, and seeded.

(13) All approaches shall be completed prior to issuance of the CCC for the road. A two (2) year maintenance / warranty period shall apply to all approaches from the date that the CCC is issued.

(14) All inspections related to the location and installation of the approach shall be completed by the County in accordance with the current Fee Schedule. This applies to all approaches, including field approaches.

Table 2000-5 below identifies the typical geometric and design requirements for approaches within the County. These requirements are also illustrated in Drawing A-9.1, included in Schedule A-2: Standard Road Drawings.

Table 2000-5: Geometric and Design Requirements for Approaches

Geometric and Design Component	Requirement
Minimum Distance from:	
Intersection Centre Line (Centre to Centre)	25 m
Bridge File (Bridge or Culvert)	60 m
At-Grade Railway Crossing	60 m
Another Approach on Same Side of Road	15 m
Maximum Approach Gradient (from Road Shoulder to Property Line)	+ 2%*
Standard Approach Geometry:**	
Minimum Surface Width	10 m
Turning Radius for Approach	10 m
Sideslope Ratio (compatible with roadway 4:1)	(3H:1V maximum)
Joint/Shared Approach Geometry:**	
Minimum Surface Width	15 m
Turning Radius for Approach	10 m
Sideslope Ratio (compatible with roadway 4:1)	(3H:1V maximum)
Culvert Requirements (as required):	
Material	New, Corrugated Steel Pipe (CSP) with Sloped End
Minimum Diameter	500 mm
Minimum Length	18 m (Standard Approach) 24 m (Joint/Shared Approach)
Minimum Cover over Pipe	0.3 m
Minimum Size of Rip Rap	200 mm Diameter
Placement of Rip Rap (at Inlet and Outlet)	Around Sloped Culvert Ends; Extend 1.0 m past Culvert Ends
Minimum Buffer to Power Pole, Power Pole Anchor, or Utility Pedestal from Culvert End	6 m

* For a +2% slope, the approach surface shall be crowned 2% in both directions.

** For Industrial / Commercial Road access, approach surface width shall be minimum 9 m and the turning radius shall accommodate the largest truck traffic design vehicle which will utilize the approach.

2206 Cul-de-Sacs

Proposed municipal improvements shall include a cul-de-sac for roads which dead-end.

The minimum radius of cul-de-sac bulbs shall be 15.8 m to the edge of pavement or face of curb. A maximum 2% grade is allowed. Drawing E-10 and E-11, included in Schedule A-2: Standard Road Drawings, provide minimum cul-de-sac dimensions for various ROW widths.

A temporary cul-de-sac shall be provided when there is a likelihood of extending the road to adjacent properties or as part of a multi-phase subdivision plan. ROW required for the temporary cul-de-sac shall be provided as a temporary easement, pending forward extension of the road. Drawing A-10 and A-11, included in Schedule A-2: Standard Road Drawings, illustrates the typical requirements for a temporary cul-de-sac.

2207 Walkways / Pathways

In a country residential and rural setting, walkways and pathways shall be gravel surfaced and compacted to 98% of Standard Proctor Density (SPD).

In a hamlet or cluster residential setting, walkways and pathways shall be asphalt concrete or cement concrete surfaced at the discretion of the County. Surface types for walkways and pathways in other locations shall be approved by the County on a case-by-case basis.

The minimum width for walkway and pathways shall be 1.2 m.

2208 Fences

The Developer is responsible for fencing of all property lines along the road ROW, including areas where road widening has been surveyed out or where there is a caveat in place, in accordance with the County's standard. If the County removes and reconstructs a fence that was built in the improper location, the Developer shall be invoiced for all expenses related to the fence removal and reconstruction. If a Developer removes fencing along an existing road ROW, it is the responsibility of the Developer to replace the fence with a new fence in accordance with the *Land Use Bylaw*, using the same materials as was previously used, at the Developer's expense.

A Temporary Fence – Standard Class B fence to be utilized (3 wire with 10 m post spacing)

2209 Topsoil and Seeding

Topsoil shall be stripped from the construction site and stockpiled for redistribution on the sideslopes, ditches, and backslopes following construction or for landscaping use.

All topsoil spread on road sideslopes, ditches, and backslopes shall be free of rocks, boulders, gravels, or other deleterious materials. Any visible stones, rocks, or boulders shall be removed from site prior to topsoil placement.

The thickness of the topsoil placed shall not be less than 150 mm. The topsoil surface shall be graded and smoothed to the approved design grade and lines.

Upon completion of topsoil placement, the surface shall be lightly compacted and seeded with a seed mix specification approved by the County.

All work associated with topsoil and seeding shall comply with the *Land Use Bylaw*.

2210 Rock Ditch Checks

Rock ditch checks and / or erosion control blankets, at the County's discretion, shall be required for a drainage channel or road ditch with a grade more than 4.0% and with velocities that warrant protection to prevent scour and erosion.

If the Developer fails to provide adequate studies and analysis regarding erosion control, it shall be the responsibility of the Developer, at the Developer's expense, to mitigate and repair erosion damage.

2211 Postal Box Turnout

Residential, Condominium, Internal Subdivision, and Industrial / Commercial Roads shall have a Postal Box Turnout in accordance with Drawing A-12 and Drawing A-13 (for 20 m and 30 m ROW, respectively), included in Schedule A-2: Standard Road Drawings. Sightline requirements, in accordance with TAC's *Geometric Design Guide for Canadian Roads,* shall be maintained at all times.

The Postal Box Turnout shall be located a minimum distance of 50 m along the road from the edge of pavement on an intersecting road or cul-de-sac and shall be located on the right-hand side. The final location shall be approved by the County and Canada Post.

2212 Road Signs and Painting

Municipal road names shall be approved by the County.

A typical plan for the installation of a Municipal Road Name sign is included as Drawing A-13, in Schedule A-2: Standard Road Drawings. Signs are to be located in the northeast quadrant of the intersection, approximately 2.0 m from the adjacent property lines. The sign shall be installed such that the bottom edge of the sign is 2.4 m above the edge of pavement on the adjacent roadway, with a minimum bury depth of 0.75 m for the sign post.

All other traffic control devices and paint required for paved roads shall be installed in accordance with TAC's *Manual of Uniform Traffic Control Devices for Canada*.

Road ban signs are required on all paved roads.

2213 Obstructions on Road ROW / Road Allowance

The Developer shall not erect any gates, walls, monuments, signs, billboards or any other form of obstruction, either temporarily or permanently, within the road ROW or road allowance without prior approval of the County. The County shall not accept a CCC until all unauthorized obstructions are removed.

2214 Guardrail

Guardrail shall be considered in accordance with AT's *Highway Geometric Design Guide* and *Roadside Design Guide*.

2300 Geometric Design

2301 Vertical Alignment

The following criteria outline the minimum requirements with respect to vertical alignment for proposed municipal improvements on roadways. AT's *Alberta Highway Geometric Design Guide* shall be used for design requirements not referenced below:

(1) Minimum gradient shall be 0.60% for ditch drainage;

(2) Maximum gradient shall be 7% at the discretion of the County, a steeper grade may be considered; and,

(3) Maximum gradient of +2% for a minimum distance of 30 m from the shoulder of an intersecting road.

All vertical curves shall be designed to meet the minimum "K" values as shown in Table 2000-6 below. The minimum length of vertical curve, in metres, shall be greater than or equal to the design speed of the road, in kilometres per hour.

Table 2000-6: Minimum "k" Values for Vertical Curves

Design Speed km/h	Minimum " K" Value	
	Sag Vertical Curve	Crest Vertical Curve
50	12	10
60	20	15
70	25	25
80	35	35
90	40	55
100	50	75

2302 Horizontal Alignment

The minimum radius of curvature for the centerline of a road is dependent upon the road designation and design speed. The horizontal alignment for all municipal projects including new roads and improvements of existing alignments shall be designed to parameters not lower than those included in Table 2000-7 below. The requirements listed below apply for two-lane roadways only; if the proposed roadway cross-section includes more than two travelling lanes, the Consulting Engineer shall prepare a design in accordance with AT's *Alberta Highway Geometric Design Guide*.

Table 2000-7: Horizontal Alignment Requirements

Road Classification	Design Speed (km/h)	e_{max} (m/m)	Min. Radius (m)	Min. Spiral Parameter – A (m)	Min. Tangent Runout Length (m)
Local Road					
Residential Road (Rural Standard)	50	0.06	90	65	30
Internal Subdivision Road	60	0.06	130	85	30
Low Volume Road	60	0.06	130	85	30
Collector					
Industrial / Commercial Road	60	0.06	130	85	30
Service Road	60	0.06	130	85	30
Major Collector					
Municipal Road (Gravel Standard)	90	0.06	340	160	30
Municipal Road (Paved Standard)	110	0.06	600	220	30
Arterial	Shall be dealt with on a case-by-case basis				

2400 Surfacing Structure Design and Construction

2401 Subgrade and Grading

The subgrade is the natural soil and / or rock material, or constructed earth fill, underlying the surfacing structure of a roadway. Surfacing structures are engineered to distribute stresses imposed by traffic to the subgrade; for this reason, the subgrade condition is a major factor in designing an appropriate surfacing structure. The properties of the subgrade can vary widely over the length of a project.

Organic soils, trees, stumps, and other deleterious materials are not acceptable as subgrade materials and shall be removed from within the roadway, ditches and backslopes. Organic soil

shall be stockpiled and used as loam on the roadway side-slopes and ditches for reclamation of disturbed areas after roadway construction.

The following criteria outline the County's requirements for subgrade and grading design and construction:

(1) The road subgrade shall be constructed in accordance with the neat lines, grades, and sections shown on the plans approved by the County.

(2) Prior to fill being placed for the surfacing structure, the exposed subgrade surface shall be scarified and re-worked to a depth of 300 mm and re-compacted to 100% of SPD.

a. It is responsibility of the Developer and Consulting Engineer to ensure that the existing subgrade has adequate strength to carry the predicted traffic loads over the entire design life of the road. The Consulting Engineer shall perform California Bearing Ratio (CBR) tests on soil samples to assess the in-situ condition of the subgrade and determine the required surfacing structure.

b. If testing indicates an expansive or low-strength subgrade (i.e. with a liquid limit greater than 40), the Consulting Engineer may propose the following engineering or construction method alternatives to the County for consideration:

i. Treating expansive soil with lime or other additives;

ii. Replacing expansive soil with non-expansive materials; and,
iii. Use of geotextile fabric to limit water infiltration of the subgrade.

Alternatives shall be recommended by a professional geotechnical engineer and all costs shall be borne by the Developer.

Geotextile fabric shall be stored and placed as per the manufacturer's guidelines.

The area to be covered by geotextile fabric shall be graded to a smooth, uniform condition, free of ruts, holes, and protruding objects such as rocks or sticks, prior to placement of the geotextile.

Geotextile fabric damaged during placement shall be repaired as per manufacturer's guidelines.

(3) All rocks greater than 100 mm in diameter shall be removed from the subgrade surface prior to compaction.

(4) All backfill materials shall be compacted to 95% of SPD in lifts not exceeding 150 mm. The final 300 mm of backfill material shall be placed in two (2) equal layers and compacted to 100% of SPD.

(5) Moisture and density tests shall be taken separately for each lift placed; in addition to the test results, materials testing reports shall note the date that the material was placed, the date that the test was completed, and the horizontal and vertical locations of the tests.

(6) The Developer shall have the Consulting Engineer certify true and submit copies of all field test results to the County. All associated costs shall be borne by the Developer.

(7) Upon completion of subgrade construction, the Consulting Engineer shall request a joint Proof-Roll Inspection with the County to be conducted in accordance with Schedule A-1: Subgrade Proof-Rolling Inspections, contained herein.

The Developer shall not be allowed to move excavated materials out of the municipal improvement site or to haul subgrade materials from other locations into the municipal improvement site without written approval from the County. Where it is necessary to haul material in or out of site, the Developer shall submit a written request to the County and shall include detailed information including, but not limited to, the type and quantity of materials to be moved, the origin and destination of the materials, the intention for use of such materials, and a written consent from

landowners receiving / supplying the materials. A Lot Grading Permit, Quality Test, Road Use Agreement, and / or Natural Resources Extraction Permit may also be required.

The subgrade and grading design shall consider the existing surface drainage patterns and shall be an integral part of the stormwater management plan, addressing any drainage work and / or diversions as approved in writing by Alberta Environmental and the County.

The subgrade and grading design shall also address the location and construction of lot approaches. Approaches shall be designed and located in accordance with Section A.2.5 above. Approaches, once finalized, shall not be relocated, reconstructed, or otherwise altered without prior written approval from the County.

2402 Granular Base Course

The following criteria outline the County's requirements for granular base course (GBC) design and construction:

(1) The minimum depth of GBC material required by the County is:

a. 200 mm for Residential roadways; and,

b. 300 mm for Industrial / Commercial roadways, including Municipal Road, Road Allowances, and Service Roads.

These depths are based on a soaked CBR value for the subgrade of 3.0 or greater. It is the responsibility of the Developer's Consulting Engineer to confirm the soaked CBR values of the in-situ or other materials used and to provide recommendations for GBC thicknesses for soils with a CBR value less than 3.0.

(2) The minimum depth of GBC material required for Arterial class roads will be determined on a case-by-case basis. Designation 2, Class 20 or Designation 2, Class 25 crushed granular shall be used for all GBC material in road construction. Specifications for this material shall be in accordance with the Specifications for Aggregate included in AT's *Standard Specifications for Highway Construction.*

(3) Prime coat shall be applied to the finished GBC surface prior to placement of asphalt concrete pavement.

(4) GBC shall be placed in accordance with the lines, grades, and sections shown on the plans approved by the County.

(5) GBC shall be uniformly compacted to 100% of SPD in lifts not exceeding 150 mm.

(6) Density tests shall be taken separately for each lift placed; in addition to the test results, testing reports shall note the date that the material was placed, the date that the test was completed, and the horizontal and vertical locations of the tests.

(7) All material tests shall be undertaken in accordance with the requirements set forth in Section A.4.4 of this document.

(8) Excessive watering during compaction shall be avoided to protect from wash-out of fine materials.

(9) All segregated materials shall be mixed thoroughly prior to compaction.

(10) Upon completion of GBC placement and compaction, the Developer shall repair any and all damages to the shoulders, sideslopes, and ditches resulting from the work; the road shall be left neatly trimmed in accordance with the cross-sections approved by the County.

(11) The Developer shall remove all excess gravel from the road shoulder, sideslopes and ditches. All disturbed areas shall be free from gravel and other deleterious materials and shall be topsoiled and seeded in accordance with Section A.2.9 above.

2403 Asphalt Concrete Pavement

The following criteria outline the County's requirements for asphalt concrete pavement (ACP) design and construction:

(1) Pavement designs shall be prepared by a qualified professional engineer, shall be based on projected 20-year traffic volumes, shall include a review of subgrade drainage and the water table, and shall provide recommendations for the use of sub-drain and membrane separation.

(2) The minimum depth of ACP material required by the County is identified in Table A-8 below. These depths are based on a soaked CBR value for the subgrade of 3.0 or greater. It is the responsibility of the Developer's Consulting Engineer to confirm the soaked CBR values of the in-situ or other materials used and to provide recommendations for ACP thicknesses.

(3) The ACP shall be placed in a minimum of two (2) lifts in accordance with Table 2000-8 below, or as approved by the County; the second lift of ACP shall not be placed until two (2) winter seasons have passed and all necessary repairs to the road surfaces, including approaches, have been completed to the satisfaction of the County.

Table 2000-8: Minimum ACP Depth Requirements

Road Classification	Min. Total Depth of ACP (mm)	Depth of First Lift (mm)	Depth of Second Lift (mm)
Local Road Collector – Service Road	100	50	50 (Min.)
Collector – Industrial / Commercial Road*	130	75 (Max.)	70 (Max.)
Major Collector – Road Allowance (Paved Standard)**	110	60	50 (Min.)

* For Industrial / Commercial roads, the first lift of ACP shall not exceed 75 mm in depth; each subsequent lift of ACP shall not exceed 70 mm in depth over all previously-paved surfaces.

** For a Road Allowance (Paved Standard) sub-classification, the minimum depth of ACP (110 mm) may be placed in two lifts at the time of initial construction; however, the two-year maintenance / warranty period shall still apply.

(4) An increased depth of ACP may be required at major intersections identified by the County.

(5) All paved road surfaces shall have a 2% cross fall unless otherwise noted and approved by the County.

(6) ACP shall be a hot mixed (temperature between 140°C and 160°C) combination of coarse aggregates and fine aggregates, with or without mineral filler, uniformly coated, and mixed with asphalt cement.

(7) No asphalt shall be placed on or against any surface with a temperature less than 5°C.

(8) ACP mixes shall follow the requirements set forth in the latest edition of AT's Standard Specification for Highway Construction, Edition 15 (or latest version):

a. Conventional Mix "B" Asphalt shall be used for surface and overlay asphalt

b. Conventional Mix “A” Asphalt may be used as base course asphalt at the sole discretion of the County.

(9) All material tests shall be undertaken in accordance with the requirements set forth in Section A.4.4 of this document.

2404 Material Testing

Table 2000-9 below identifies the material and material testing requirements for road construction within Wheatland County.

Table 2000-9: Material Testing Requirements

ASTM Standard	Test Description	Minimum Number of Test Required	Comments
Grading (Silts and Clays)			
D-698 D-1557	Standard Proctor	One (1) per soil type	Additional test if the soil type changes
D-1557 D-2167 D-2922	Percent Density and Moisture-In-Place	One (1) every 100 m, for each 300 mm lift, min. 5 tests	Top two (2) lifts – 98% of SPD Bottom lifts – 95% of SPD
Granular Base Course and Granular Fill			
C-136 C-117	Sieve Analysis	One (1) for every (up to) 1000 tonnes	Gradation specifications for aggregate provided in Table A-10.
D-698 D-1557	Standard Proctor	One per source	
D-3017	Field Density	One every 50 m for each lift ≤150 mm, min. 5 tests	Every lift – 100% of SPD
Asphalt Concrete Pavement			
MS-4*	Marshal Mix Design	One (1) per source and project	Alberta Transportation Standard Specifications for Highway Construction - Table 3.50.3.2
D-2172 C-136 C-117 D-2726 D-3203	Asphalt Cement Content Aggregate Gradation Marshal Briquettes, Air Void, Stability	One complete set every 1,000 tonnes, min. 1 test	All Marshall Briquettes from field VMA%14, Marshal Stability 7100mim, Flow 10-16,Air Void 3-5%, Film thickness min 7.0 µm, asphalt cement content min. 6%
D-976 D-3203 D-2726	Compaction by Coring Air Void %, Thickness	One core per 250 tonnes, min. 3 cores	Minimum 97% of Marshal Density, Thickness for each sample core.
	Field density, Nuclear method	One per 50 m, min. 5 tests	Minimum 97% of Marshal Density

* Asphalt Institute Manual (not an ASTM Standard)

CSA Standard	Test Description	Minimum Number of Test Required	Comments
Portland Cement Concrete			
A23.2-1C	Sampling Concrete	Minimum of one per day	On larger pours a strength test will be taken on approximately each 30 m^3 portion of the concrete pour.
A23.2-5C	Slump	Minimum of one per day	For each compressive strength test a slump test will be performed and the amount of entrained air measured.
A23.2-4C	Entrained Air	Minimum of one per day	For each compressive strength test a slump test will be performed and the amount of entrained air measured.
A23.2-3C	Making and Curing Compressive Strength Specimens	Minimum of one per day	On larger pours a strength test will be taken on approximately each 30 m^3 portion of the concrete pour.
A23.2-9C	Compressive Strength	Minimum of one per day	On larger pours a strength test will be taken on approximately each 30 m^3 portion of the concrete pour.

Table 2000-10: Specifications For Aggregate

DESIGNATION		1				2				3				4			5		6		7	8	9
Class (mm)		10	12.5	16	25	*16(N2)	20	25	40	12.5AW	12.5BW	12.5C	16	20	25	40	10A	10B	80	125	40	25	8
Percent Passing Metric Sieve (CGSB 8-GP-2M) : m	125 000																			100			
	80 000																		100				
	50 000																		55-100	55-100			
	40 000								100							100					100		
	25 000				100			100	70-94						100				38-100	38-100		100	
	20 000				85-95		100	82-97						100		55-90							
	16 000			100	75-87	100	84-94	70-94	55-85				100						32-85	32-85		90-100	
	12 500		100	80-92	65-80	89-100				100	100	100	72-95										
	10 000	100	83-92	70-84	58-72	78-94	63-86	52-79	44-74	35-65	55-75	70-93	53-82	35-77	30-77	25-72	100	100			85-100	45-75	
	8 000																						100
	5 000	60-75	55-70	50-65	40-58	55-70	40-67	35-64	32-62	0-15	0-15	30-60	27-54	15-55	15-55	8-55	70-90	45-70	20-65	20-65		0-15	85-100
	1 250	26-45	26-45	26-45	25-44	26-45	20-43	18-43	17-43	0-3	0-3	9-28	9-28	0-30	0-30	0-30	20-45	20-45			40-100	0-5	45-75
	630	18-38	18-38	18-38	16-36	18-38	14-34	12-34	12-34														30-50
	315	12-30	12-30	12-30	10-28	12-30	9-26	8-26	8-26			0-15	0-15				9-22	9-22	6-30	6-30	17-100		18-30
	160	8-20	8-20	8-20	6-18	8-20	5-18	5-18	5-18			0-11	0-11				5-15	5-15					10-21
	80	4-10	4-10	4-10	4-10	4-10	2-10	2-10	2-10	0-0.3	0-0.3	0-8	0-8	0-12	0-12	0-12	0-10	0-10	2-10	2-15	6-30		5-15
% FRACTURE BY WEIGHT (2 FACES)	ALL +5000	*See Note (N1)				60+	60+	60+	50+	75+ (100% 1 Face)	75+ (100% 1 Face)	60+	60+	40+	40+	25+	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PLASTICITY INDEX (PI)		NP	NP	NP	NP	NP	NP-6	NP-6	NP-6	N/A	N/A	NP-4	NP-4	NP-8	NP-8	NP-8	NP-6	NP-6	NP-8	NP-8	NP-5	NP-5	NP
L.A. ABRASION LOSS PERCENT MAX.		40	40	40	40	50	50	50	50	35	35	35	35	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35
FLAKINESS INDEX		N/A								MAX 15							N/A						
COEFFICIENT OF UNIFORMITY (CU)		N/A																			3+	N/A	

Designations:
Designation 1 – Asphalt Concrete Pavement
Designation 2 – Base Course Aggregate
Designation 3 – Seal Coat Aggregate
Designation 4 – Gravel Surfacing Aggregate
Designation 5 – Sanding Material
Designation 6 – Gravel Fill
Designation 7 – Cement Stabilized Base Course Aggregate
Designation 8 – Granular Filter Aggregate
Designation 9 – Slurry Seal Aggregate

*Notes:
N1. According to Alberta Transportation Specification 3.50, Asphalt Concrete Pavement – EPS or Alberta Transportation Specification 3.53, Asphalt Concrete Pavement – Superpave and Mix Type Specified
N2. Designation 2 Class 16 Material is for ASBC
N3. For crushed aggregate other than all Designation 5 and Designation 9 materials, a tolerance of three percent in the amount passing the maximum sieve will be permitted provided all oversize material passes the next larger standard sieve size
N4. Unless otherwise specified, Pit-Run Aggregate will be defined as unprocessed granular material, with no specified gradation requirement, that is extracted from an aggregate deposit.

Note: Retrieved from Alberta Transportation Standard Specifications for Highway Construction (Table 3.2.3.1)

Notes

1. A deviation of a single value for asphalt pavement thickness or density shall be acceptable within ± 5% of the targeted range; the average value shall meet the design requirements.
2. An average density value of less than 92% or an average asphalt cement content more than 5% below the design requirement shall require removal of the material unless otherwise specified by the County.

At the discretion of the County, the Developer shall provide deflection testing to ensure results are in accordance with Table 2000-11 below. The tested average deflections shall be based on a minimum of 10 Benkelman Beam Tests and a testing interval of 50 m or less.

Note: If the Falling Weight Deflectometer is used, a formula for converting FWD deflections to Benkelman Beam equivalents is required.

Table 2000-11: Deflection Testing Requirements

Road Classification	Maximum Average Deflection (mm)
Local Roads	50
Collectors	35
Major Collectors	25
Arterial Roads	25

2500 Shallow and Overhead Utilities

As part of the proposed municipal improvement work the Developer shall submit a Shallow / Overhead Utilities Plan. This plan shall include plan and profile views, identifying any and all existing and proposed shallow / overhead utilities, and shall be submitted with the other drawings for review and approval by the County.

All shallow / overhead utilities shall have a separate, designated utility ROW located outside of the road ROW, unless otherwise mutually agreed to in a joint Utility Right-of-Way (URW) agreement with the County.

All shallow utilities, either new or existing, crossing a roadway shall be located at a minimum depth of 1.20 m below the finished ditch bottom. Transformers, pedestals, or other utility furniture shall not be placed within or on a drainage course nor within the road ROW.

The Developer shall be responsible to relocate all shallow / overhead utilities as may be required to meet the requirements; this relocation shall be performed at the Developer's expense.

2501 Utility Corridors

For development servicing, corridors may be required for routing of utility mains, secondary emergency access, walkways, and / or major drainage outside of the road ROW. Where the corridor is used for access, walkways, and / or major drainage, a Public Utility Lot (PUL) shall be provided. The PUL is generally 6.0 m wide with a 2.0 m easement on each side of the PUL for a total ROW width of 10.0 m.

Where the corridor is only required for routing of utility mains, it shall be contained within an easement. The easement is generally 10 m wide with 8.0 m located on one lot and 2.0 m on an adjacent lot. The following conditions shall apply, as well as any further conditions as set forth by the applicable Utility Company, to any easement containing deep utilities:

(1) The property owner shall not be permitted to use the easement area for any purpose other than for lawn and / or garden purposes;

(2) The property owner shall not be permitted to place, erect, or build any concrete or asphalt driveways, pads or paths, rock garden, building, or structure whatsoever within the boundaries of the easement;

(3) The property owner shall not be permitted to plant any tree, hedge, or other vegetation which in any way prevents or hinders the County's rights to maintain all utilities under such lands;

(4) If the area is to be fenced, the property owner shall be required to install 7.0 m gates to allow for maintenance vehicle access; and,

(5) The property owner shall be permitted to park private cars, trucks, and / or recreation vehicles upon such land.

The preceding conditions shall be included in the information package provided to the prospective lot purchaser.

2502 Shallow Utility Systems

The purpose of the Utilities Plan is to establish the proposed system requirements. Temporary facilities (e.g. overhead power or telecommunication lines), if required due to the proposed subdivision phasing, shall be shown on the plan along with the proposed permanent facilities.

The shallow utility companies shall be provided with a copy of the applicable plans indicating the proposed locations of deep utilities and road layouts to assist them in locating surface features such as transformers, switch gear, telephone switching cabinets, etc.

2503 Gas, Power, Telephone and Cable Television Standards

The Developer is required to prepare a detailed Utility Plan for each proposed phase of development. The Developer shall make arrangements for the provision of natural gas, power, telephone, and cable television service for each phase of development, as applicable / available.

Power, telephone and cable television services are generally installed in a common trench; however, each utility company shall be contacted to review their alignments and prepare their design.

The Developer is responsible for coordinating the location of the power, gas, telephone and cable television, including obtaining alignment approvals, as applicable / available.

The Developer is responsible for any and all expenses related to the provision of power, gas, telephone and cable television to service a municipal improvement, including the cost of installing ducts for road crossings.

2504 Electric System/Lighting

As detailed in the Development Agreement, the Developer shall arrange for the installation of street / walkway lighting and power distribution in accordance with the following:

(1) An Electrical Consulting Engineer shall prepare the design in accordance with these guidelines and a qualified contractor shall complete all electrical installations in accordance with the Power Distributor's Construction Specifications;

(2) The design of the power system shall be approved by the current Power Distributor prior to installation;

(3) The installation shall be inspected by the current Power Distributor; and,

(4) Energization of the system shall be done by the current Power Distributor once they have accepted the system.

The electrical servicing plan shall conform to the current Power Distributor's standards. The electrical layout plan shall be in accordance with the requirements set forth in the distributors standards.

2600 General Construction Requirements

The following general construction requirements and policies shall be adhered to:

(1) The Developer shall enter into a Development Agreement with the County and shall supply an irrevocable Letter of Credit for 125 % of the approved cost estimate prior to commencement of construction. This amount shall be returned to the Developer when the CCC is issued by the County with an amount retained (25 %) to cover a two (2) year maintenance / warranty period and any outstanding deficiencies as noted on the approved CCC.

(2) The County assigns Prime Contractor responsibilities, as specified in the Occupational Health and Safety Act, to all parties with which it enters into contracts and agreements. The Developer shall familiarize itself, its staff and its Contractor(s) / Subcontractor(s) with the terms of the Occupational Health and Safety Act and Regulations thereunder to ensure complete understanding respecting the responsibilities given and compliance required. The Developer acknowledges that it is and assumes all of the responsibilities and duties of the Prime Contractor as defined by the Occupational Health and Safety Act, and that it shall, as a condition of the Contract / Agreement, comply with the Occupation Health and Safety Act and the Regulations thereunder.

(3) A site meeting shall be held prior to the start of construction; the Contractor(s), the Developer, the County and the Consulting Engineer shall be in attendance.

(4) The Developer shall be responsible for obtaining all required approvals for road closures, utility crossings, railway crossings, or other impacts requiring approval from applicable stakeholders.

(5) All phases of construction shall conform to good engineering practice and be in a manner considered acceptable by the County.

(6) A qualified geotechnical consulting company shall complete quality control material testing throughout all phases of construction in accordance with Table A-9 above.

(7) The Developer is responsible for locating all underground utilities within the proposed improvement area as well as any offsite locations that may be impacted. Prior to and during construction, the Developer is responsible for protecting any such utilities until the project is completed and accepted by the County.

(8) Any road-related construction item not specifically mentioned in this Guidelines and Standards document shall meet the requirements as set forth in AT's *Standard Specifications for Highway Construction*, or as otherwise indicated by the County.

Schedule 2000-1: Subgrade Proof-Rolling Inspections

The primary purpose of proof-rolling the subgrade is to locate yielding subgrade. Soft subgrade areas that are located shall be corrected with the intent to secure a uniform subgrade, of adequate supporting capability.

Proof-rolling shall be done immediately after regular compaction, before the subgrade becomes too dry or wet for effective rolling inspection. For maximum effectiveness, proof-rolling shall be completed when the moisture content of the subgrade soils is near optimum or at the moisture content at which compaction was achieved. All roadways and approaches shall be proof-rolled at the same time.

When unsuitable material is encountered it shall be excavated to a depth deemed sufficient by the Developer's Engineer.

Ruts and soft spots shall be repaired with the appropriate borrow materials and shall be inspected by the Developer's Engineer prior to request for re-inspection.

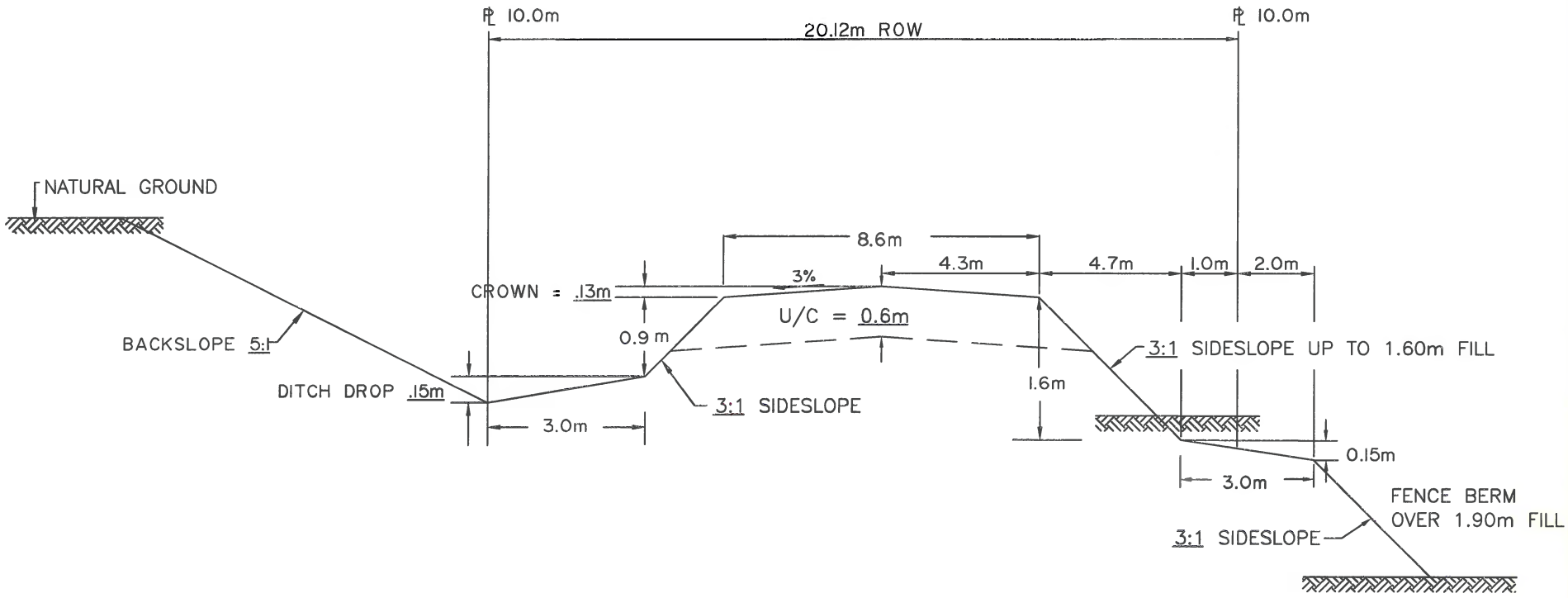
***The subgrade shall have no visible movement or deflection and shall be at optimum moisture content in order to pass the proof-roll inspection. Scaling or movement in the subgrade top shall be considered unacceptable by the County and shall result in a failed proof-roll inspection*.**

The following requirements shall apply to all Subgrade Proof-Rolling Inspections:

1. Single axle or approved tandem axle vehicle shall be allowed;
2. The total payload shall be a minimum of 15 tonnes for proof-rolling; a current weight ticket shall be provided to the County;
3. The tire pressure of the truck shall be between 100 and 120 psi;
4. Operation of the equipment shall be at a speed between 4 and 5 km/h;
5. The external temperature shall be above zero degrees Celsius and the proof-roll inspection shall be completed prior to ground freezing; in the event that temperatures fall below zero degrees Celsius overnight, the proof–roll inspection shall be re-scheduled;
6. The subgrade surface shall be smooth, with proper grades, and free of any loose or organic materials. Rocks shall be at least 150 mm below the subgrade surface; visible rocks or loose material on the subgrade surface shall result in an automatic fail of the proof–roll inspection and re-inspection shall be required, with all applicable fees;
7. All conduit crossings shall be completed prior to the proof–roll inspection;
8. Gravel or other granular layers shall not be applied to a subgrade surface prior to receiving an approved proof- roll inspection;
9. Approved gravel or other granular material shall be placed within 24 hours of an approved proof–roll inspection;
10. If the project receives significant rainfall, the proof–roll inspection shall be re-scheduled;
11. If the proof-roll inspection fails, a re-inspection fee shall apply for each trip, to be paid by the Developer prior to each inspection as per the current Fee Schedule;
12. Advanced notice of 48 hours is required for all inspections; and
13. The County has the final decision for approval / acceptance on all proof-roll inspections.

Schedule A-2: Standard Road Drawings

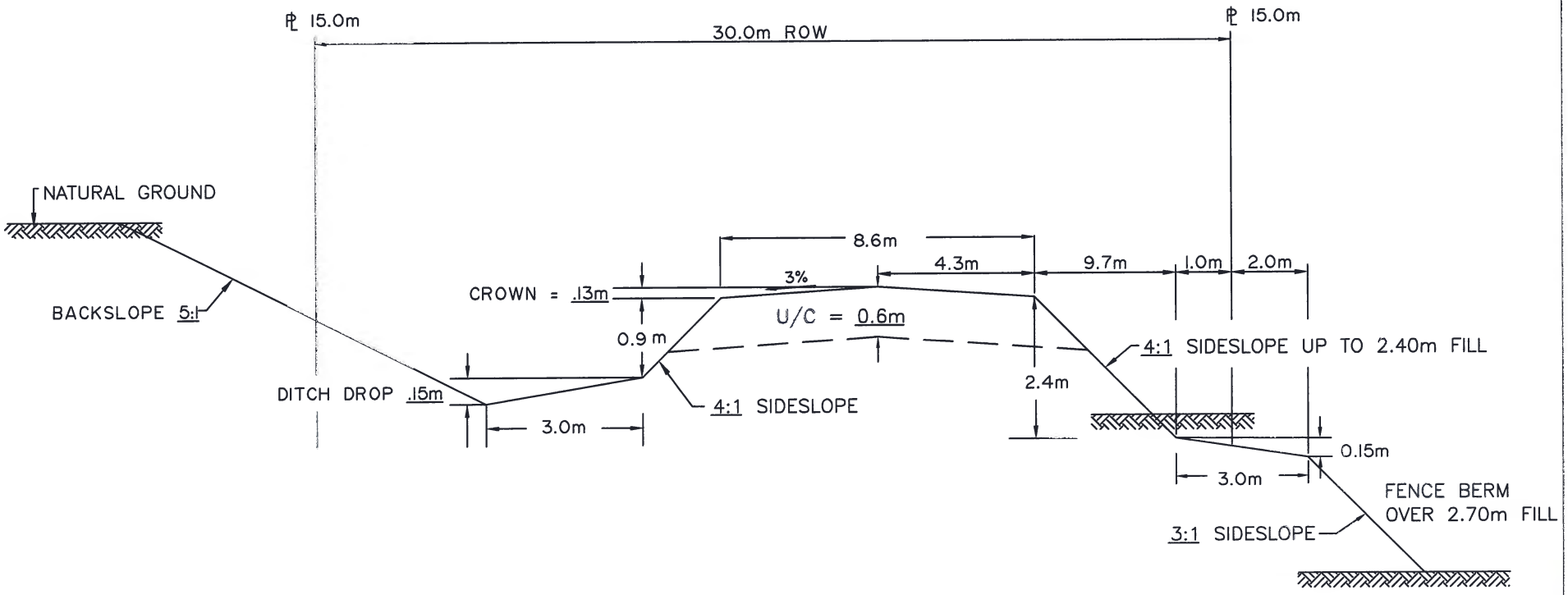
Figure A-1.1	Typical Road Cross Section on a 20.12m ROW with 8.6m Top Width & 3.0m Ditch Width
Figure A-1.2	Typical Road Cross Section on a 30.00m ROW with 8.6m Top Width & 3.0m Ditch Width
Figure A-1.3	Typical Road Cross Section on a 30.00m ROW with 10.0m Top Width & 3.0m Ditch Width
Figure A-1.4	Country Residential Road Paved
Figure A-1.5	Country Residential Road Double Seal Coat
Figure A-2	Internal Subdivision
Figure A-3	Local Road – Low Volume
Figure A-4	Road Allowance / Service Road Paved
Figure A-5	Collector Road Industrial / Commercial Road
Figure A-6	Major Collector Road Gravel Standard
Figure A-7	Major Collector Road Paved Standard
Figure A-9	Typical Road Approach
Figure A-9.1	Maximum Approach Grades to Local and Collector Roads
Figure A-10	Minimum Cul-de-sac Dimensions for a 30m Right Of Way
Figure A-11	Temporary Cul-de-sac
Figure A-12	Typical Postal Box Turnout (20.0m ROW)
Figure A-13	Typical Postal Box Turnout (30.0m ROW)
Figure A-14	Typical Installation of Municipal Road Name Signs
Figure A-15	Typical Rock Ditch Check



WHEATLAND COUNTY

TYPICAL ROAD CROSS SECTION
ON A 20.12m ROW
WITH 8.6m TOPWIDTH & 3.0m DITCH WIDTH

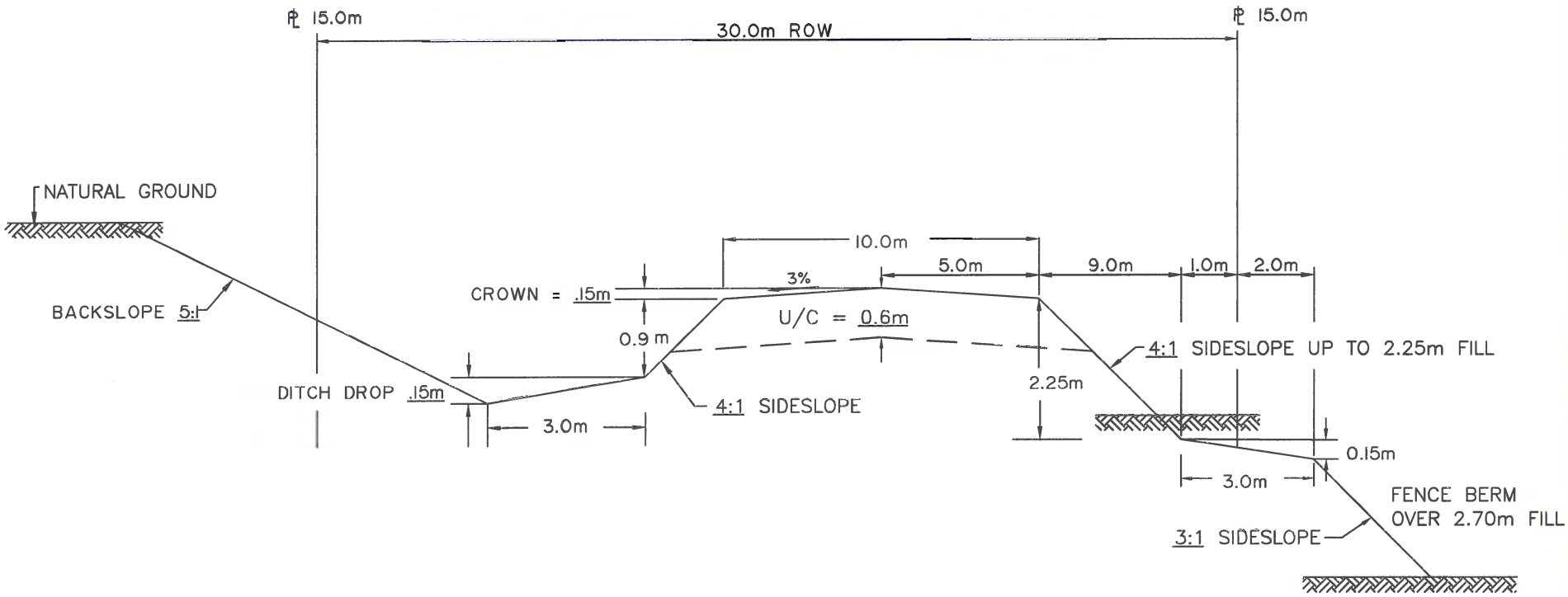
DATE	FIGURE	SCALE
2015	A-1.1	N.T.S.



WHEATLAND COUNTY

TYPICAL ROAD CROSS SECTION
ON A 30.00m ROW
WITH 8.6m TOPWIDTH & 3.0m DITCH WIDTH

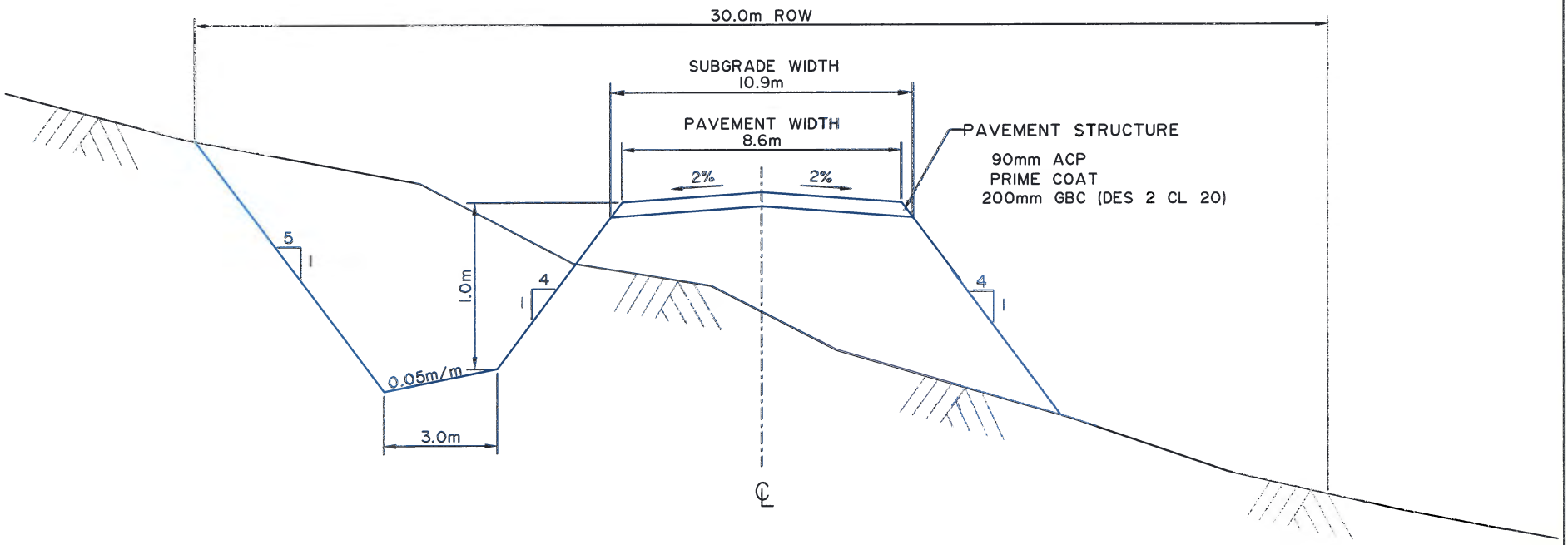
DATE	FIGURE	SCALE
2015	A-1.2	N.T.S.



WHEATLAND COUNTY

TYPICAL ROAD CROSS SECTION ON A 30.00m ROW WITH 10.0m TOPWIDTH & 3.0m DITCH WIDTH

DATE	FIGURE	SCALE
2015	A-1.3	N.T.S.



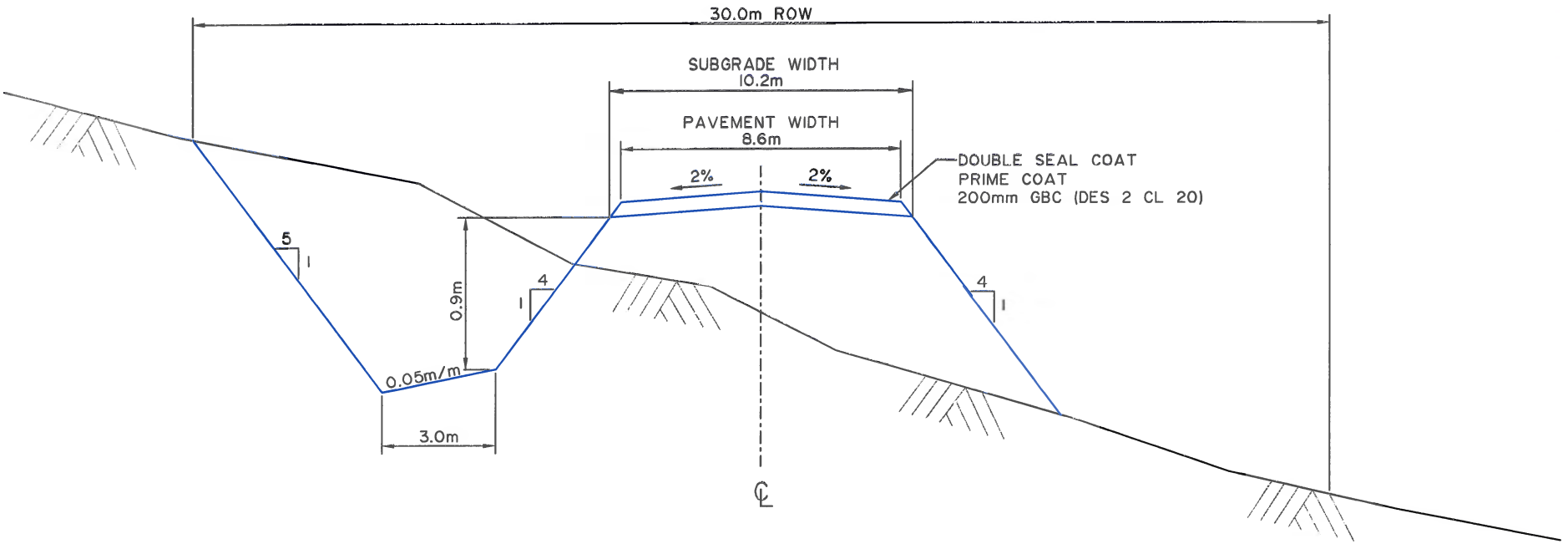
NOTES:

1. INCREASE TOTAL PAVEMENT STRUCTURE WIDTH FOR HORIZONTAL CURVES LESS THAN 300m RADIUS.
2. ALL DITCH SLOPES AND DITCH BOTTOMS REQUIRE TOPSOIL DRESSING.
3. ALL TOPSOIL TO BE REMOVED PRIOR TO BACKFILLING.
4. TOP 0.15m OF SUBGRADE COMPACTED TO 98% STANDARD PROCTOR DENSITY.

WHEATLAND COUNTY

COUNTRY RESIDENTIAL ROAD PAVED

DATE	FIGURE	SCALE
2015	A-1.4	N.T.S.



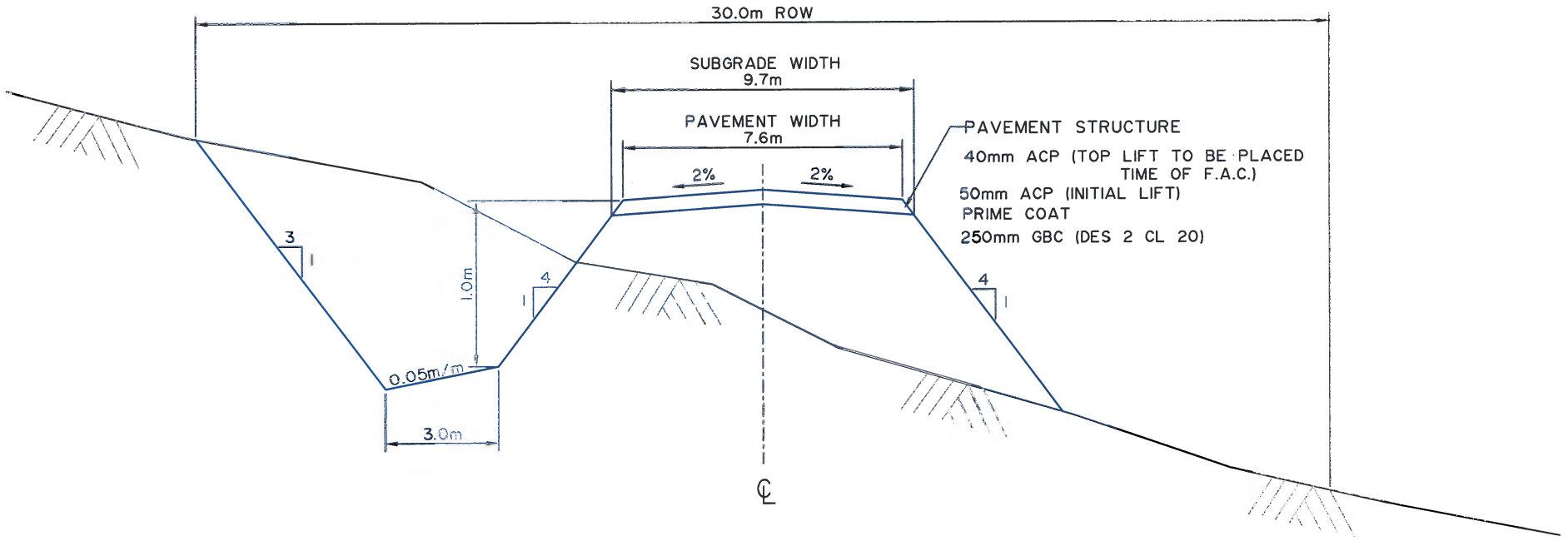
NOTES:

1. INCREASE TOTAL GBC STRUCTURE WIDTH FOR HORIZONTAL CURVES LESS THAN 300m RADIUS.
2. ALL DITCH SLOPES AND DITCH BOTTOMS REQUIRE TOPSOIL DRESSING.
3. ALL TOPSOIL TO BE REMOVED PRIOR TO BACKFILLING.
4. TOP 0.30m OF SUBGRADE COMPACTED TO 98% STANDARD PROCTOR DENSITY.

WHEATLAND COUNTY

COUNTRY RESIDENTIAL ROAD
DOUBLE SEAL COAT

DATE	FIGURE	SCALE
2015	A-1.5	N.T.S.



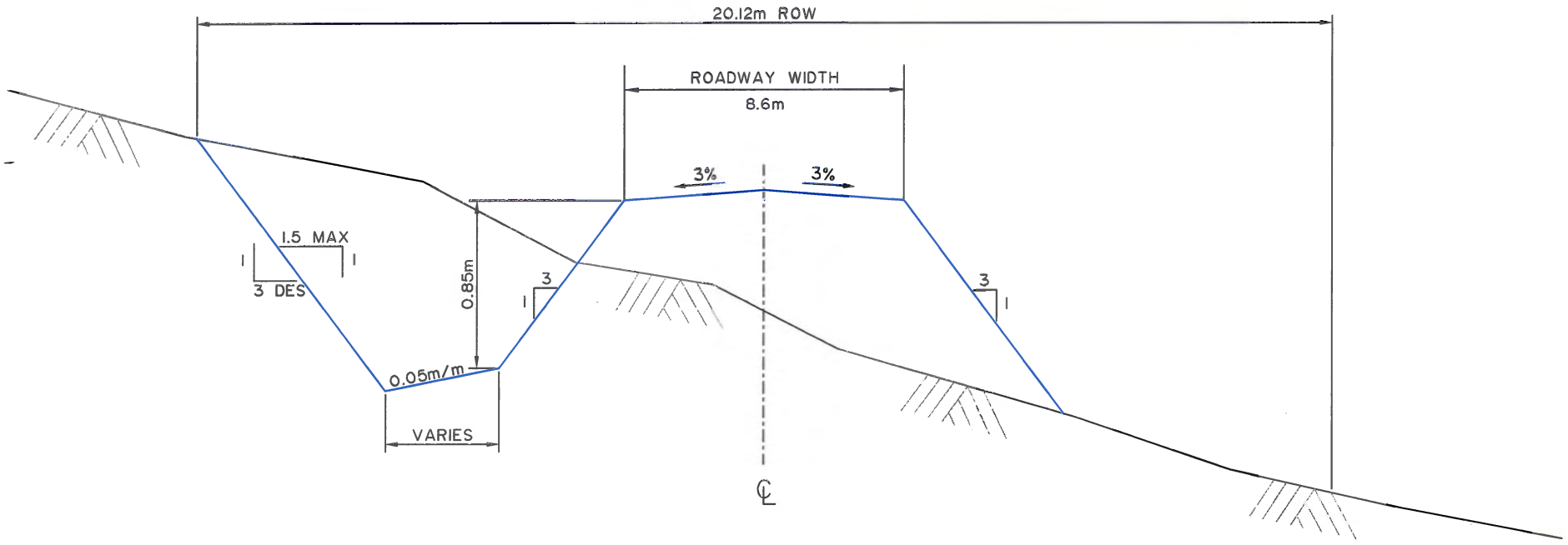
NOTES:

1. INCREASE TOTAL PAVEMENT STRUCTURE WIDTH FOR HORIZONTAL CURVES LESS THAN 300m RADIUS.
2. ALL DITCH SLOPES AND DITCH BOTTOMS REQUIRE TOPSOIL DRESSING.
3. ALL TOPSOIL TO BE REMOVED PRIOR TO BACKFILLING.
4. TOP 0.30m OF SUBGRADE COMPACTED TO 98% STANDARD PROCTOR DENSITY.
5. SERVICE ROAD PAVEMENT WIDTH 8.0m & SUBGRADE WIDTH 10.10m.

WHEATLAND COUNTY

INTERNAL SUBDIVISION

DATE	FIGURE	SCALE
2015	A-2	N.T.S.



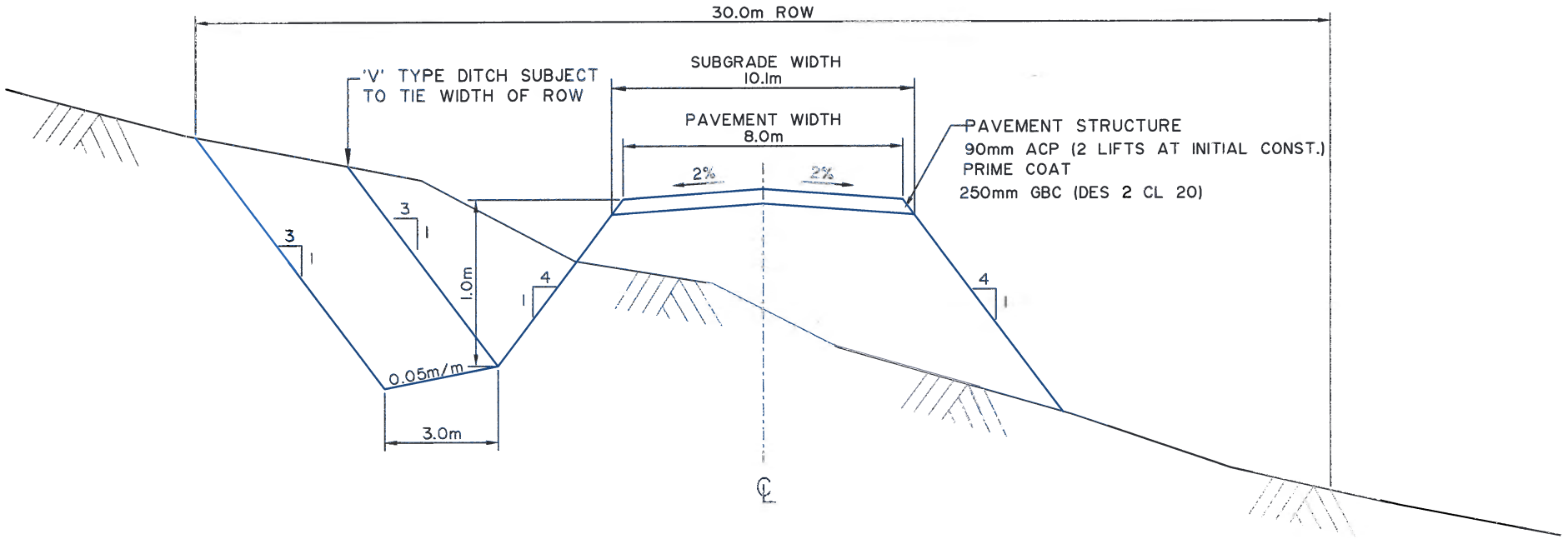
NOTES:

1. ALL DITCH SLOPES AND DITCH BOTTOMS REQUIRE TOPSOIL DRESSING.
2. ALL TOPSOIL TO BE REMOVED PRIOR TO BACKFILLING.
3. TOP 0.30m OF SUBGRADE COMPACTED TO 98% STANDARD PROCTOR DENSITY.

WHEATLAND COUNTY

LOCAL ROAD - LOW VOLUME

DATE	FIGURE	SCALE
2015	A-3	N.T.S.



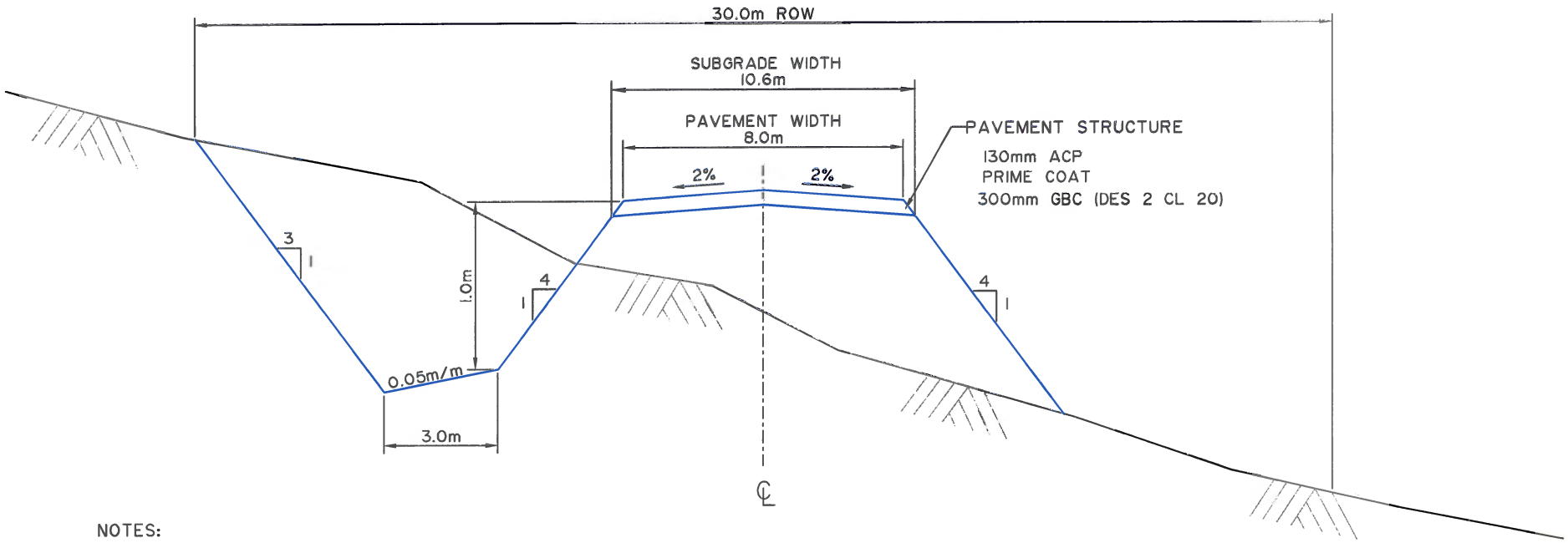
NOTES:

1. INCREASE TOTAL PAVEMENT STRUCTURE WIDTH FOR HORIZONTAL CURVES LESS THAN 300m RADIUS.
2. ALL DITCH SLOPES AND DITCH BOTTOMS REQUIRE TOPSOIL DRESSING.
3. ALL TOPSOIL TO BE REMOVED PRIOR TO BACKFILLING.
4. TOP 0.30m OF SUBGRADE COMPACTED TO 98% STANDARD PROCTOR DENSITY.

WHEATLAND COUNTY

ROAD ALLOWANCE / SERVICE ROAD PAVED

DATE	FIGURE	SCALE
2015	A-4	N.T.S.



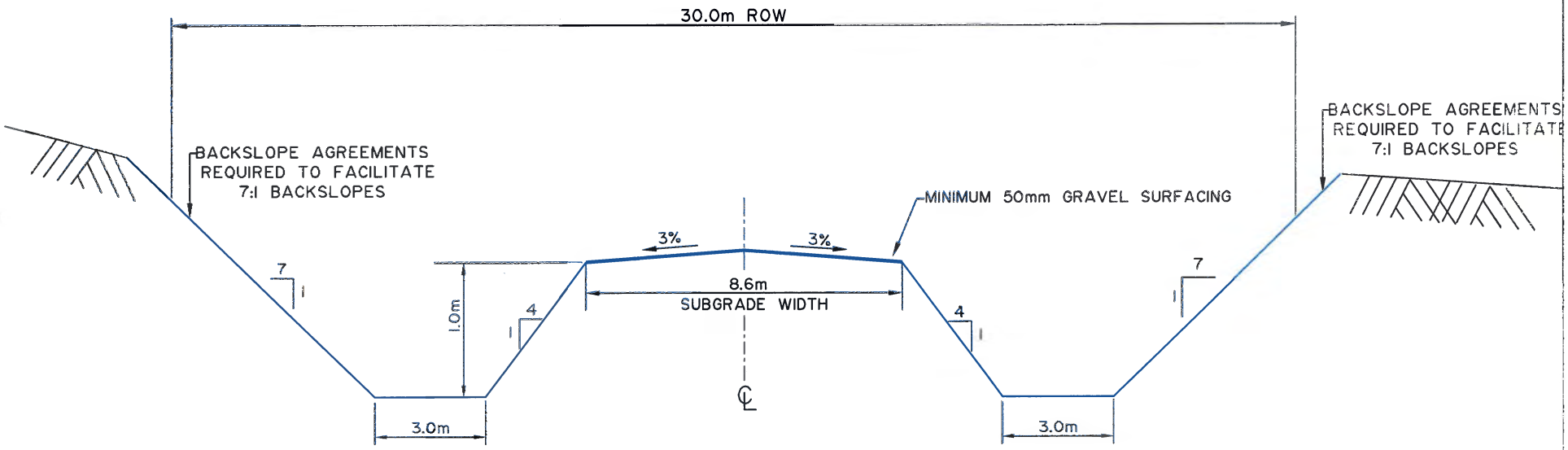
NOTES:

1. INCREASE TOTAL PAVEMENT STRUCTURE WIDTH FOR HORIZONTAL CURVES LESS THAN 300m RADIUS.
2. ALL DITCH SLOPES AND DITCH BOTTOMS REQUIRE TOPSOIL DRESSING.
3. ALL TOPSOIL TO BE REMOVED PRIOR TO BACKFILLING.
4. TOP 0.30m OF SUBGRADE COMPACTED TO 98% STANDARD PROCTOR DENSITY.

WHEATLAND COUNTY

COLLECTOR ROAD
INDUSTRIAL / COMMERCIAL ROAD

DATE	FIGURE	SCALE
2015	A-5	N.T.S.

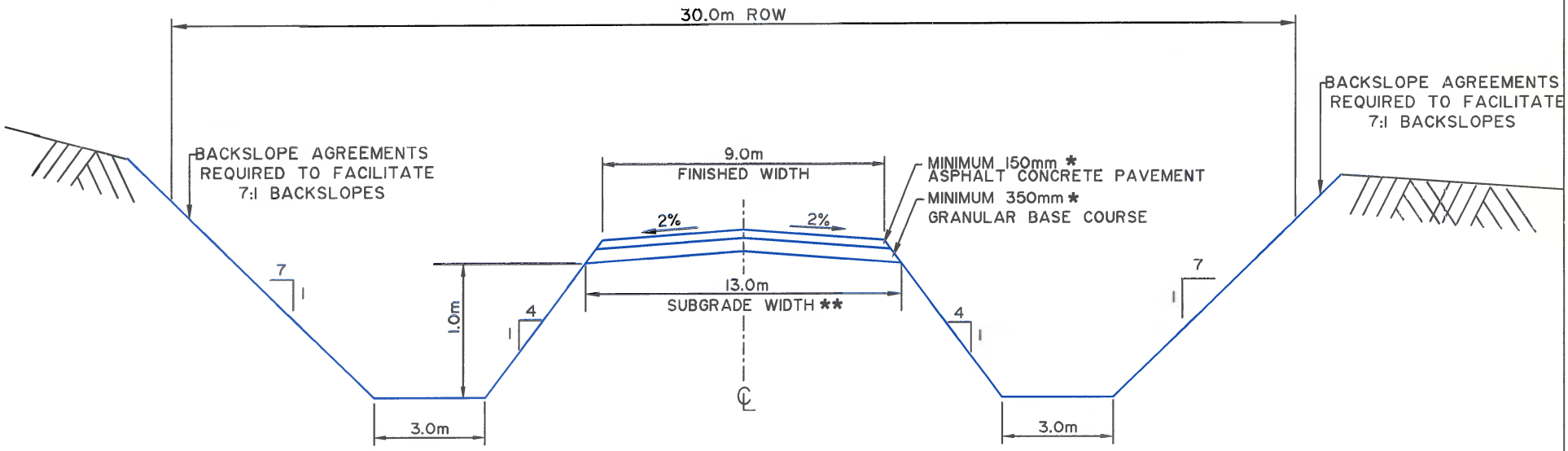


WHEATLAND COUNTY

MAJOR COLLECTOR ROAD

GRAVEL STANDARD

DATE	FIGURE	SCALE
2015	A-6	N.T.S.



*** LIFT THICKNESSES TO BE DESIGNED FOR EXPECTED TRUCK ESALS FOR A BAN FREE ROAD**
LIFT THICKNESSES SHOWN ARE MINIMUMS.

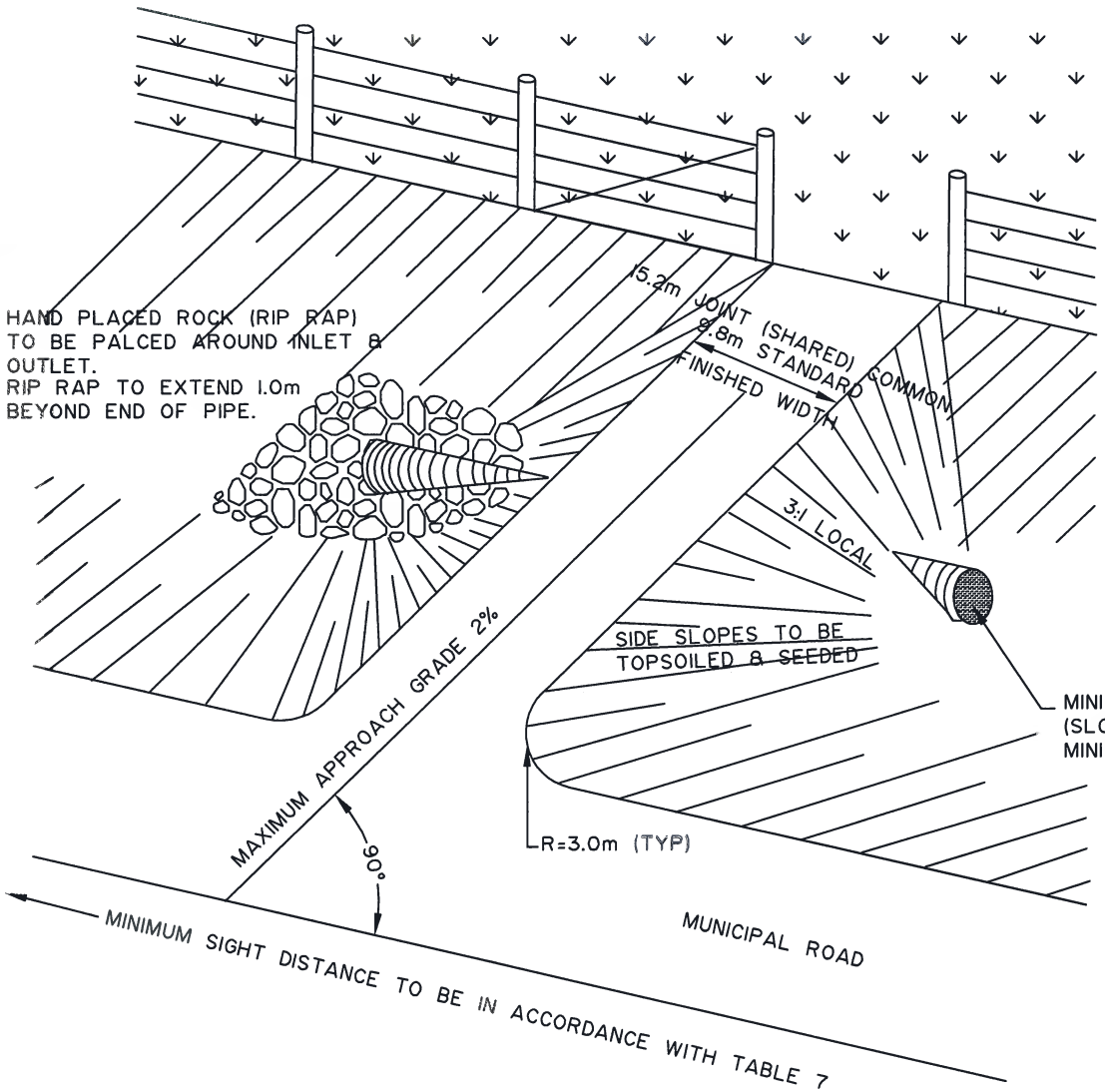
**** ACTUAL SUBGRADE WIDTH DEPENDENT ON SURFACING STRUCTUAL DESIGN**

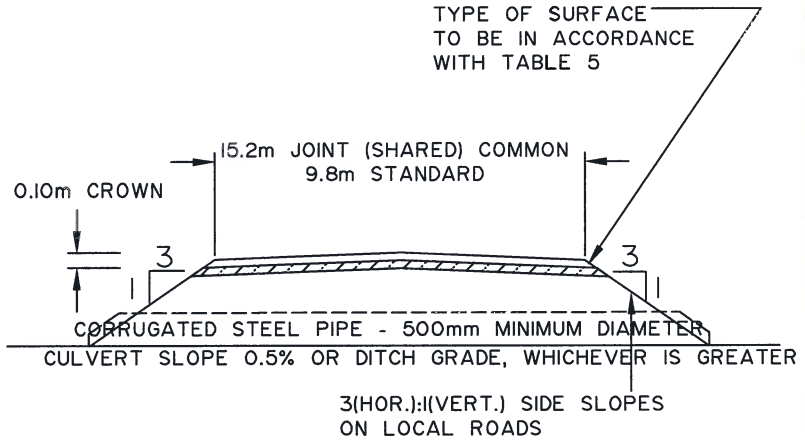
WHEATLAND COUNTY

MAJOR COLLECTOR ROAD

PAVED STANDARD

DATE	FIGURE	SCALE
2015	A-7	N.T.S.

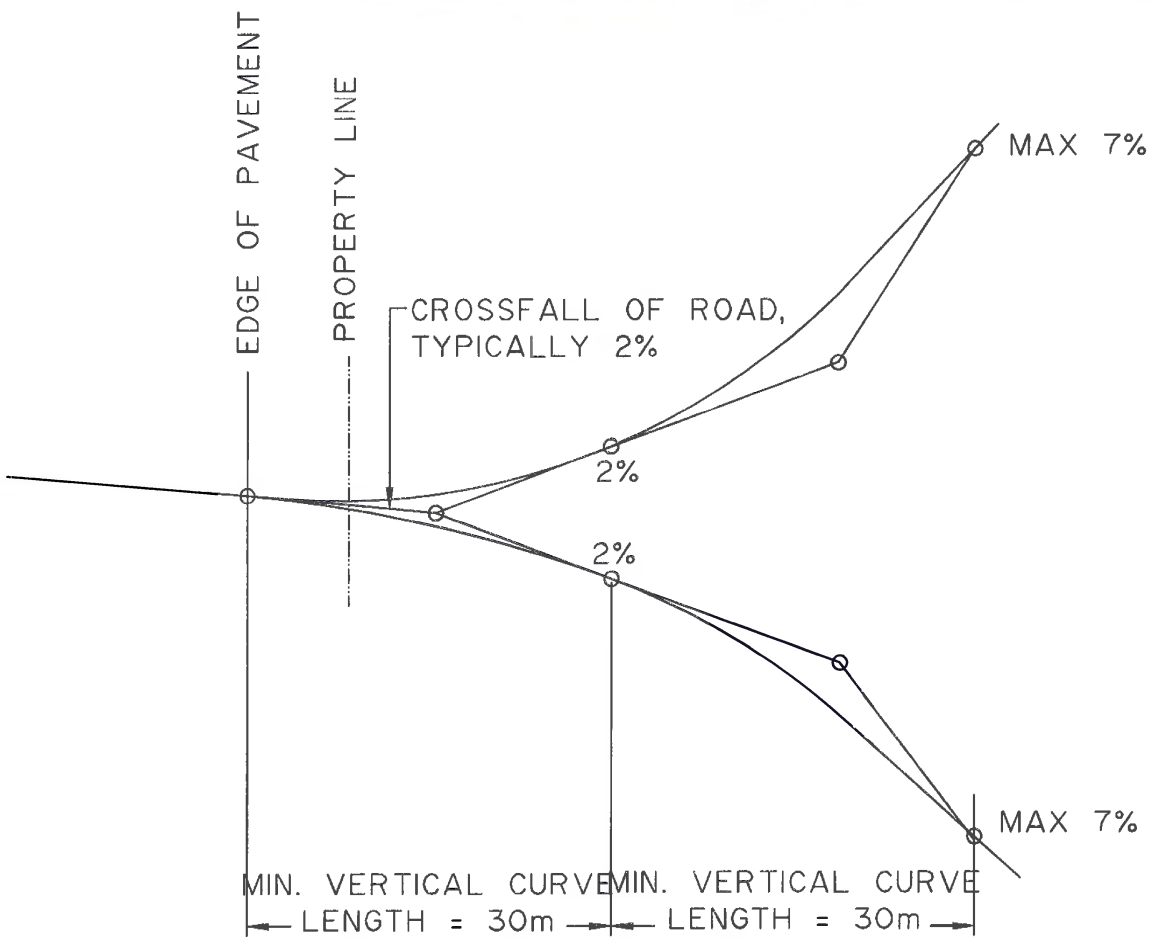




WHEATLAND COUNTY

TYPICAL ROAD APPROACH

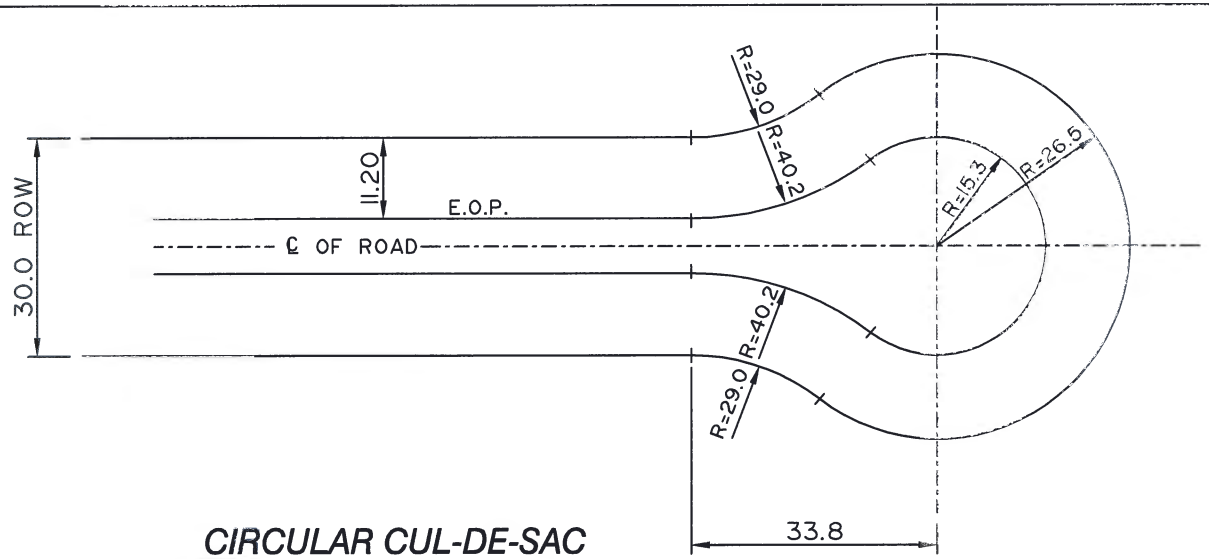
DATE	FIGURE	SCALE
2015	A-9	N.T.S.



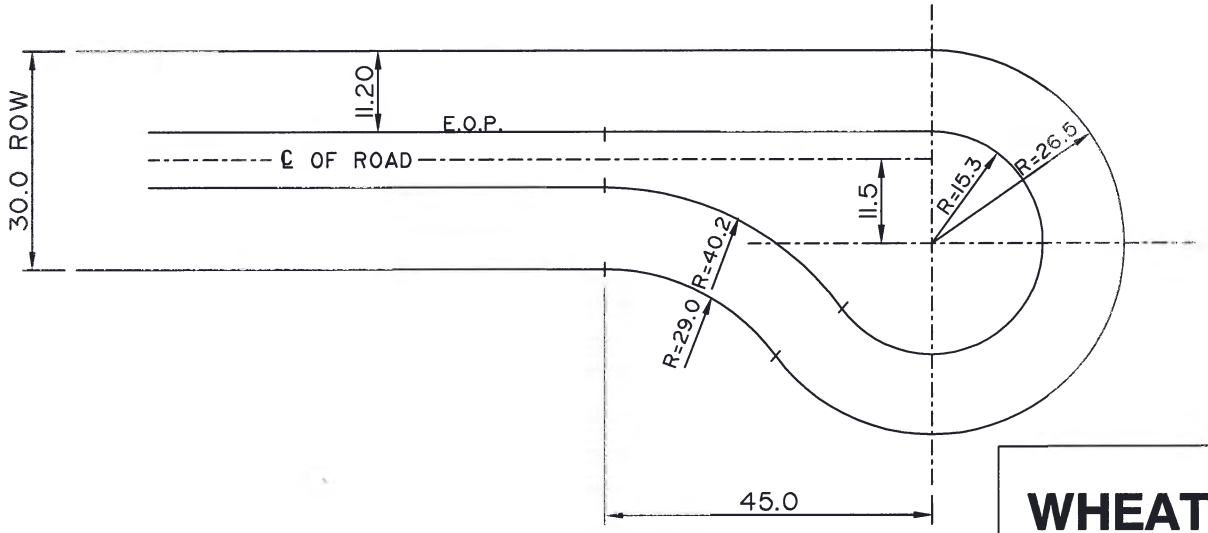
WHEATLAND COUNTY

MAXIMUM APPROACH GRADES TO LOCAL AND COLLECTOR ROADS

DATE	FIGURE	SCALE
2015	A-9.1	N.T.S.



CIRCULAR CUL-DE-SAC

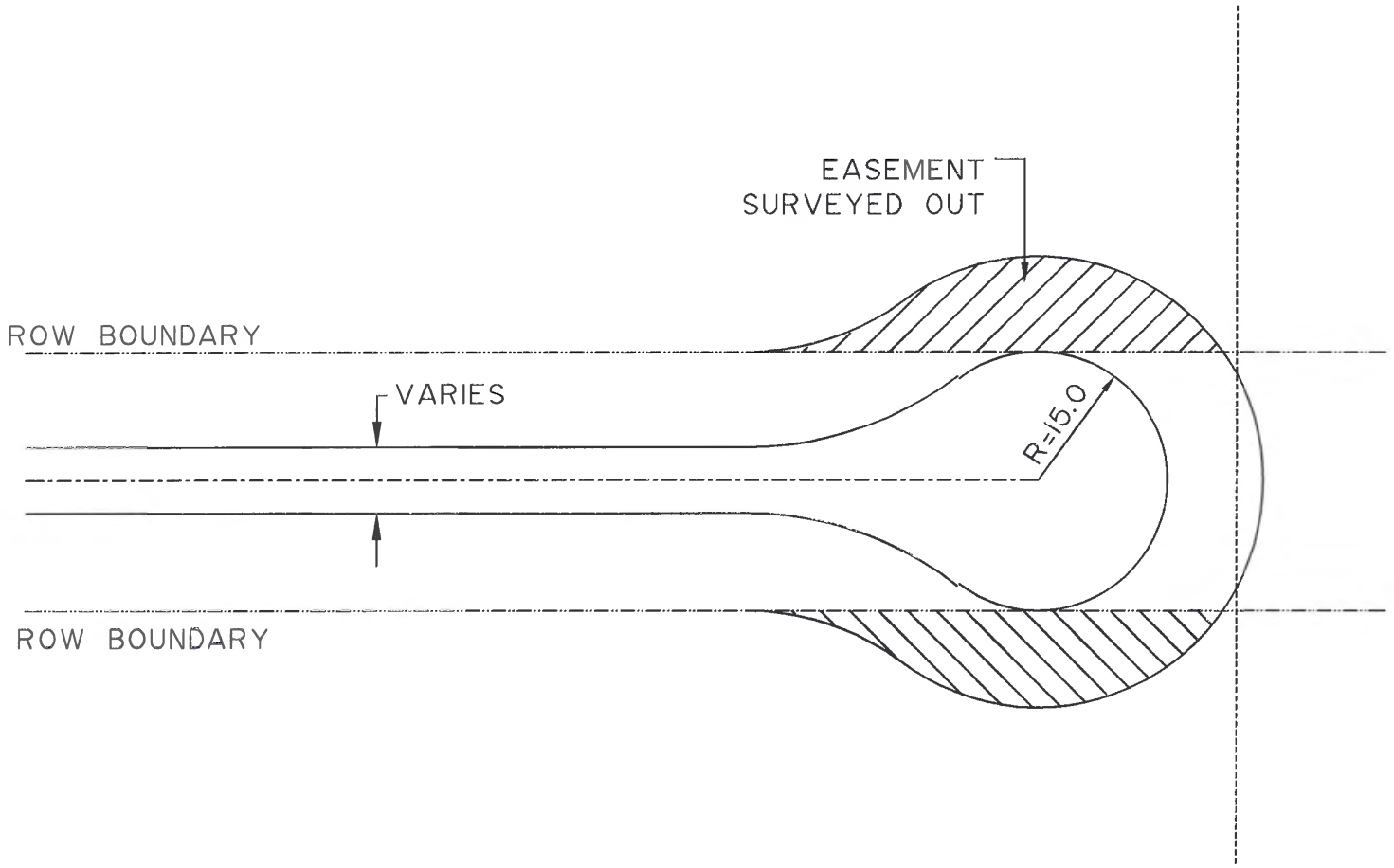


CIRCULAR OFF-SET CUL-DE-SAC

WHEATLAND COUNTY

MINIMUM CUL-DE-SAC DIMENSIONS FOR A 30m RIGHT OF WAY

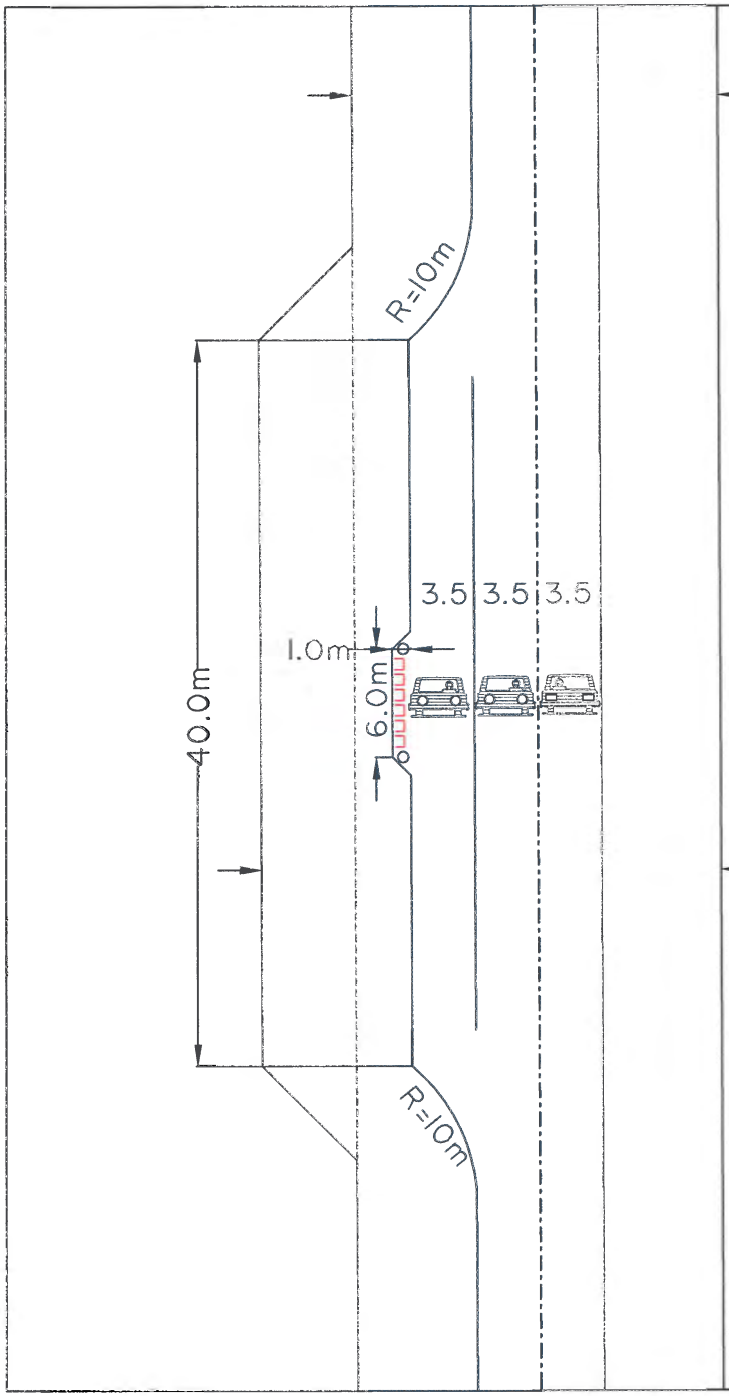
DATE	FIGURE	SCALE
2015	A-10	N.T.S.

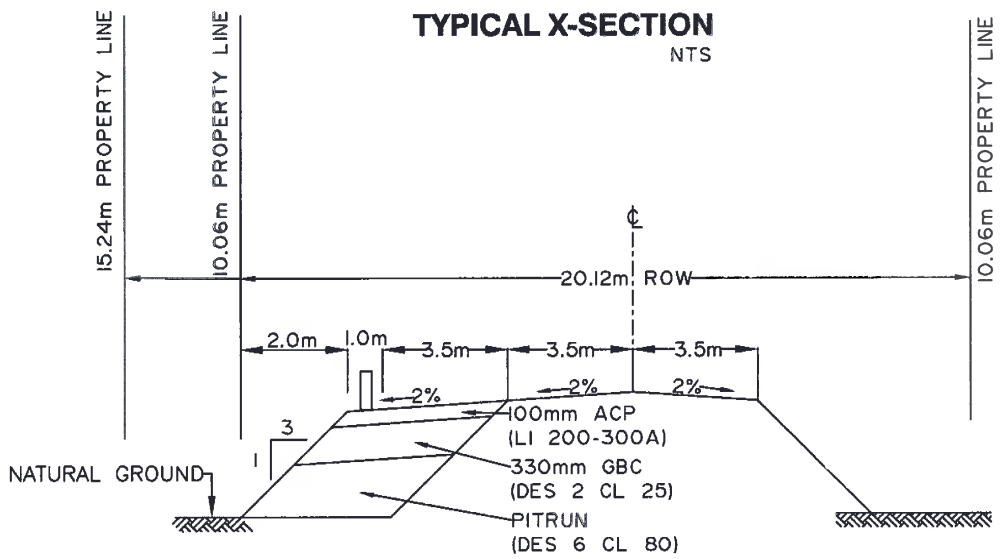


WHEATLAND COUNTY

TEMPORARY CUL-DE-SAC

DATE	FIGURE	SCALE
2015	A-11	N.T.S.

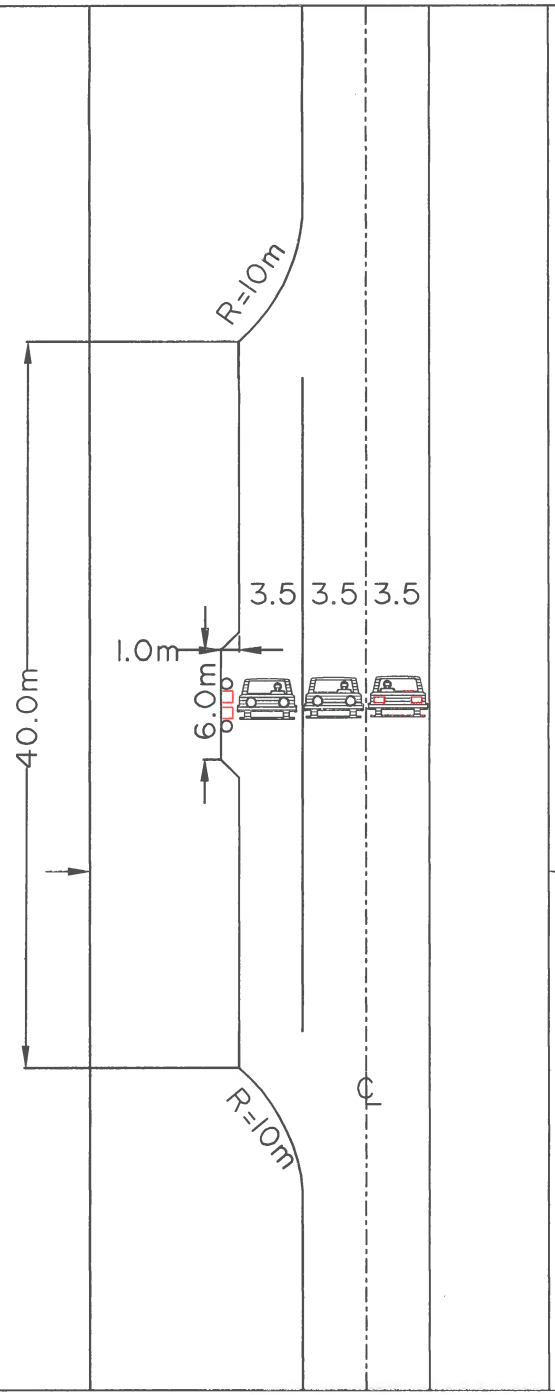


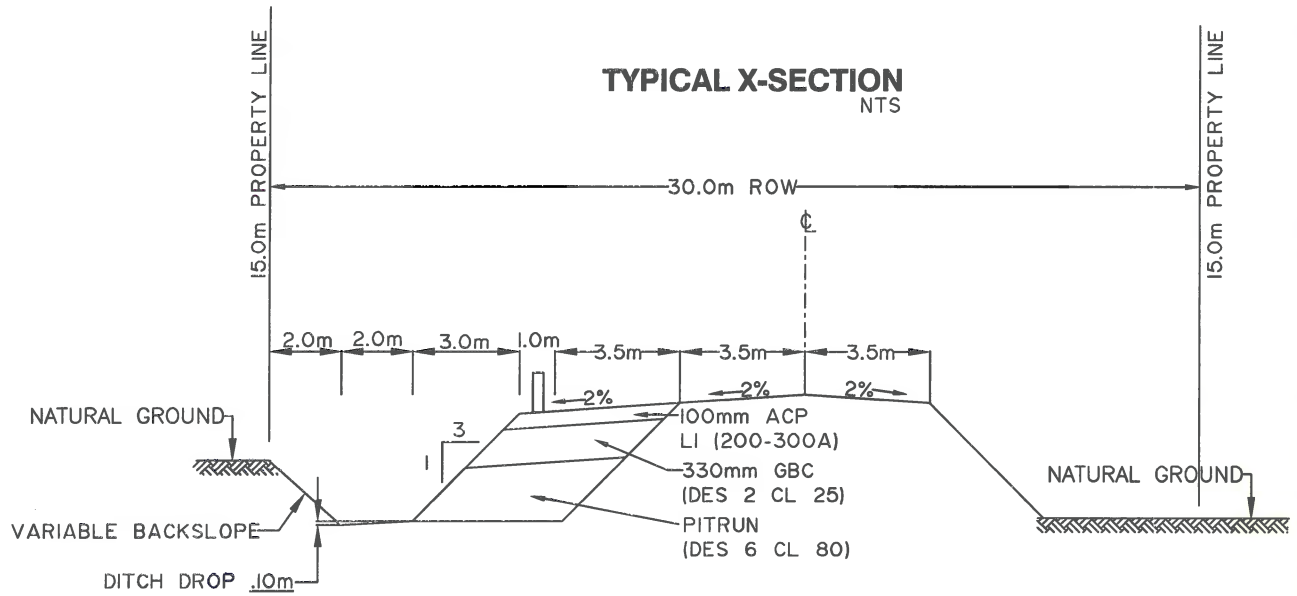


WHEATLAND COUNTY

TYPICAL POSTAL BOX TURNOUT

DATE	FIGURE	SCALE
2015	A-12	N.T.S.



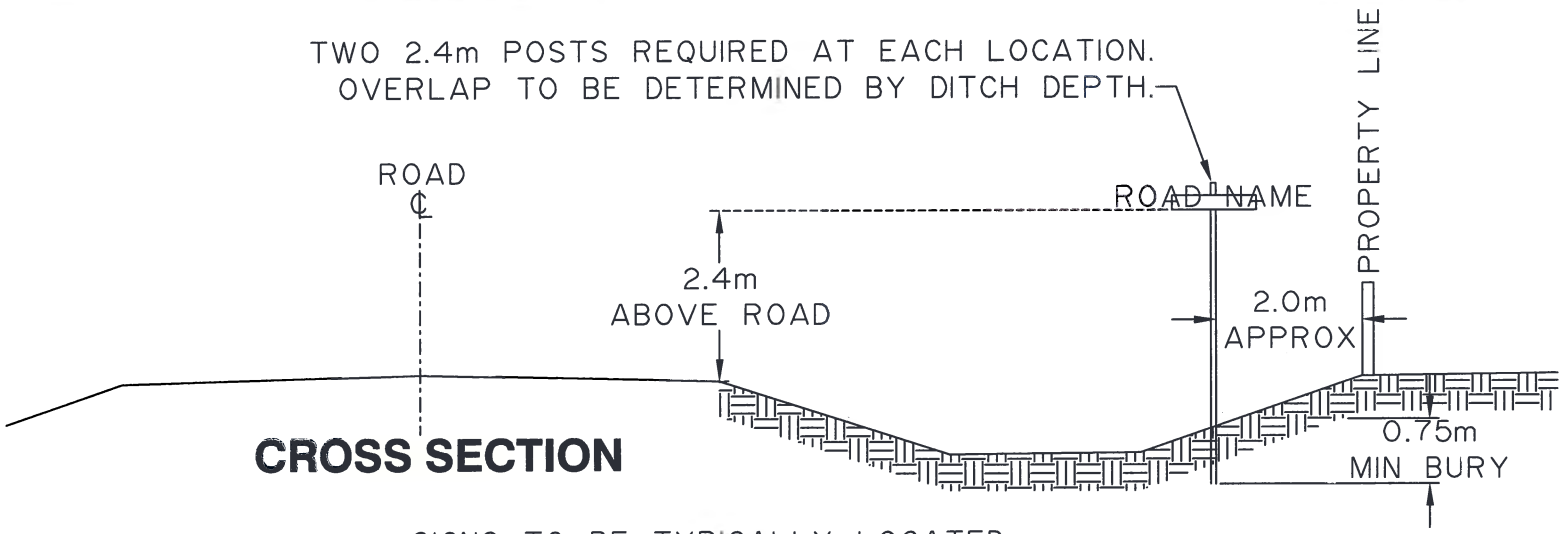


30.0m PROPOSED & EXISTING ROW

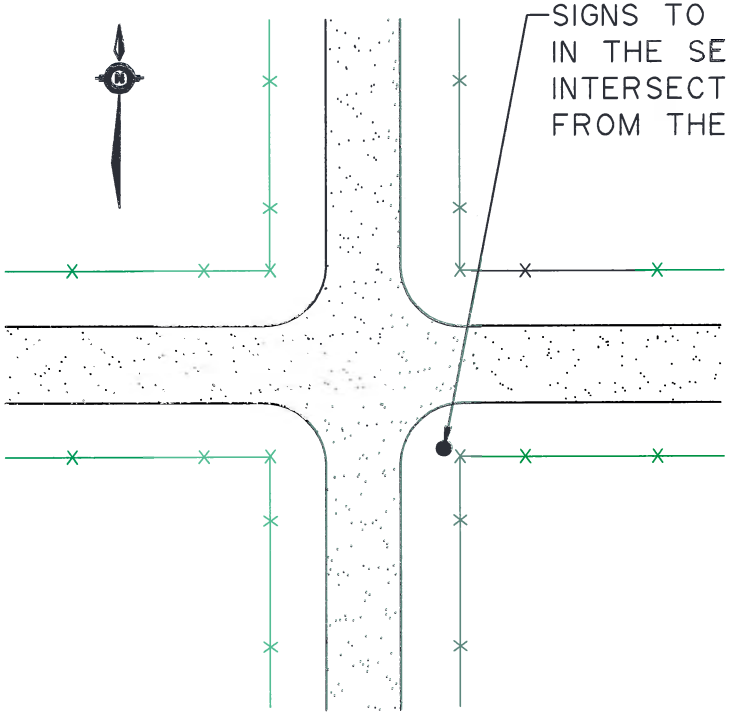
WHEATLAND COUNTY

TYPICAL POSTAL BOX TURNOUT

DATE	FIGURE	SCALE
2015	A-13	N.T.S.



CROSS SECTION



PLAN VIEW

DENOTES PROPERTY LINE

DENOTES SIGN LOCATION

NOTE:

THIS DRAWING SHOWS A TYPICAL INSTALLATION ONLY.
OFFSETS MAY REQUIRE ADJUSTMENTS FOR SPECIFIC SITUATIONS.

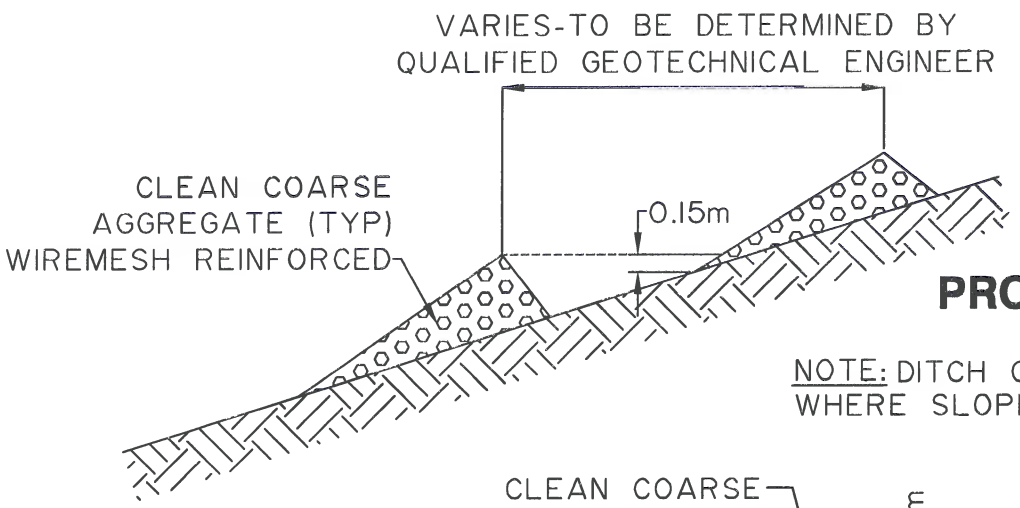
ALL SIGNS TO BE ERECTED 90° TO ROAD UNLESS OTHERWISE DIRECTED.

THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL UTILITY LOCATES AND FOR ANY REPAIR COSTS TO UTILITIES DAMAGED BY HIS CONSTRUCTION ACTIVITIES.

WHEATLAND COUNTY

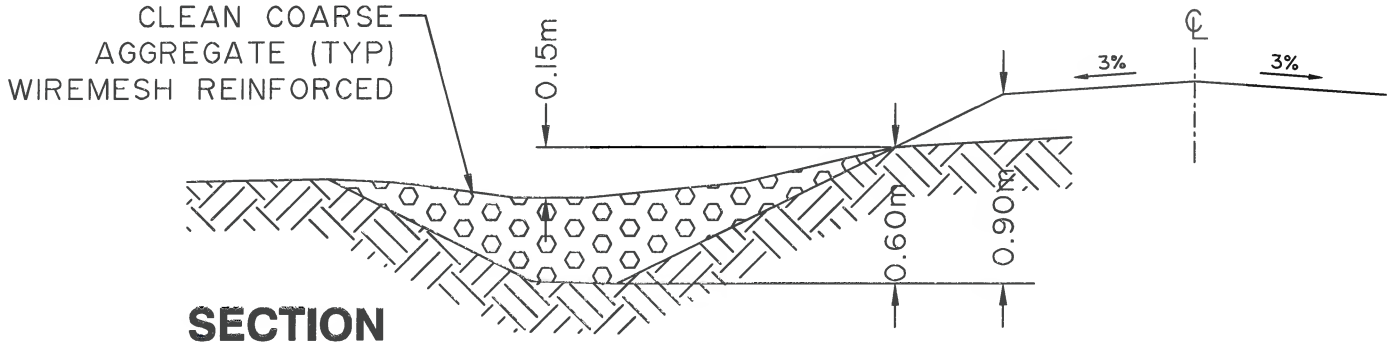
TYPICAL INSTALLATION OF MUNICIPAL ROAD NAME SIGNS

DATE	FIGURE	SCALE
2015	A-14	N.T.S.

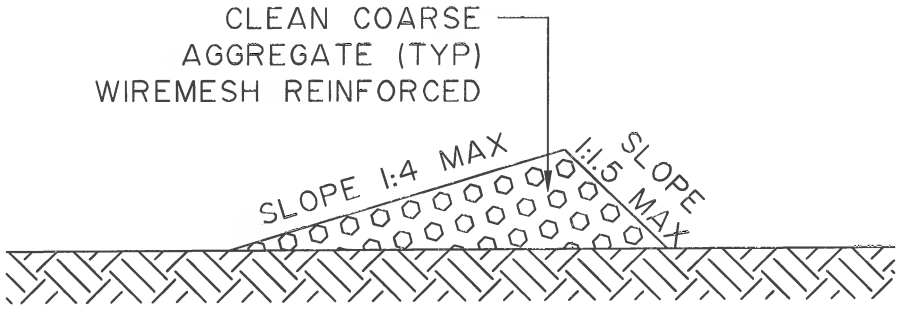


PROFILE

NOTE: DITCH CHECKS ARE REQUIRED
WHERE SLOPE OF DITCH IS 4.0% OR MORE



SECTION



DETAIL

WHEATLAND COUNTY

TYPICAL ROCK DITCH CHECK

DATE	FIGURE	SCALE
2015	A-15	N.T.S.

3000 RURAL SANITARY SEWER

3100 SYSTEM DESIGN OVERVIEW

The sanitary sewer system shall be of sufficient capacity to service the ultimate population projection of the development area.

Wheatland County Planning Policy Section 7.3 outlines the requirements for Private Sewage Disposal Systems including the Alberta Environment 2009 Private Sewage System Standard of Practice and The Model Process for Subdivision Approval and Private Sewage. In accordance with the Municipal Development Plan, all subdivision or development proposals that would result in a total of six (6) or more lots per quarter section, outside of an urban area, shall provide access to piped servicing, at the developers expense.

Where a municipal system or utility is available and connection is supported by the County the urban standards for sewer design are to be adhered to.

The Developer and the Developer's Consultant are responsible to ensure that the infrastructure is designed and constructed to achieve manufacturers' design life expectations consistent with good design and construction practice. System proposals must identify disposal means in accordance with Alberta Environment regulations and guidelines. Plan-profile drawings, specifications and a letter report shall be prepared by a qualified Professional Engineer and be submitted to the County and Alberta Environment and Parks for review and approval prior to construction.

4000 RURAL WATER DISTRIBUTION

4100 SYSTEM DESIGN OVERVIEW

Consideration of the water distribution and transmission systems shall be in accordance to the County standards.

In accordance with the Municipal Development Plan, all subdivision or development proposals that would result in a total of six (6) or more lots per quarter section, outside of an urban area, shall provide access to piped servicing, at the developers expense.

Where a municipal system or utility is available and connection is supported by the County the urban standards for potable water design are to be adhered to.

Where there are less than 6 lots per quarter section onsite wells will be considered. The design and construction of wells must adhere to the AEP standards and guidelines.

5000 RURAL STORMWATER MANAGEMENT

5100 GENERAL

The Developer and his Engineering Consultant must adhere to the guidelines presented in the latest edition of the publication "Stormwater Management Guidelines for the Province of Alberta" prepared by AEP.

The standards provided in the urban section are also to be adhered to except the minor system where there is no minor system required by the development.

When developing land in a rural setting it is important to recognize that drainage leaving a development typically flows into adjacent ditch networks and/or natural drainage courses across private property.

In addition, the engineering consultant needs to recognize that a drainage system for stormwater runoff always exists, and virtually any modification of an existing drainage system will modify the runoff characteristics of the system. Any adverse impacts resulting from this modification must be accounted for and rectified through the design of the stormwater management system.

WHEATLAND COUNTY

CONSTRUCTION STANDARDS

OCTOBER 2016

WHEATLAND COUNTY

Where There's Room to Grow


WHEATLAND COUNTY
Where There's Room to Grow

CONTENTS

WHEATLAND COUNTY
CONSTRUCTION STANDARDS
JULY 2016

1000 GENERAL

For approved materials and material testing standards the current edition of these standards are to be adhered to unless otherwise provided; should a conflict arise between reference materials, the Engineer shall decide which takes precedence.

These standards are provided to set guidelines and establish requirements regarding construction of municipal infrastructure within Wheatland County. Its objective is to ensure that all municipal infrastructure work in Wheatland County is constructed to a consistent, sustainable standard. Construction of municipal infrastructure must adhere to these standards.

The County retains the ability to refer to other applicable regional municipality Construction Guidelines, Standards and Policies where the County deems it appropriate on a case by case basis.

1100 SURVEY CONTROL MARKERS

1101 EXISTING CONTROL

.1 The Developer or their Consultant shall make every effort to protect existing markers.

.2 Markers which are destroyed or disturbed shall be replaced by the Developer at their sole expense.

1102 LEGAL POSTS

.1 Legal posts shall be placed subsequent to the installation of all utilities.

.2 All legal posts in the subdivision area shall be located within 60 days prior to application for Final Acceptance of the surface improvements.

.3 The Developer shall instruct the legal surveying consultant to replace any missing or disturbed posts as required by the Wheatland County Representative. All costs are to be borne by the Developer.

2000 ROADS

2100 GRANULAR MATERIAL

2101 PRODUCTS

2101.1 GRANULAR BASE

Crushed stone or gravel shall consist of hard, durable, angular particles, and shall be free of clay lumps, cementation, organic material, frozen material, and other deleterious materials.

Aggregates shall exhibit the following physical properties:

(i) % Fracture, by weight (*2 faces*) – 60 min

(ii) Los Angeles Abrasion, loss, % - 45 max.

(iii) Liquid Limit, % - 25 max.

(iv) Plasticity Index, % - 6 max.

(v) California Bearing Ratio, when compacted to 100% of ASTM D698 – 80 min.

Gradation shall be within the following limits when tested to ASTM C-117 with sieve sizes to CAN/CGSBD 8-GP-2M rather than ASTM E11, and to shall have a smooth curve without sharp breaks when plotted on a semi-long grading chart.

TABLE 1: GRANULAR BASE COURSE GRADATION LIMITS

Sieve Size (mm)	Percent Passing Sieve Size
25	100
20	95-100
10	55-80
5	35-65
2.5	28-52
0.630	13-35
0.315	9-26
0.160	6-18
0.080	4-10

2101.2 GRANULAR SUB-BASE

Crushed stone or gravel shall consist of hard, durable, angular particles, and shall be free of clay lumps, cementation, organic material, frozen material, and other deleterious materials.

Aggregates shall exhibit the following physical properties:

(i) % Fracture, by weight (*2 faces*) – 20 min

(ii) Los Angeles Abrasion, loss, % - 45 max.

(iii) Liquid Limit, % - 25 max.

(iv) Plasticity Index, % - 6 max.

(v) California Bearing Ratio, when compacted to 100% of ASTM D698 – 40 min.

Gradation shall be within the following limits when tested to ASTM C-117 with sieve sizes to CAN/CGSBD 8-GP-2M rather than ASTM E11, and to shall have a smooth curve without sharp breaks when plotted on a semi-long grading chart.

TABLE 2: GRANULAR SUB-BASE COURSE GRADATION LIMITS

Sieve Size (mm)	Percent Passing Sieve Size
80	100
40	60-90
20	40-70
10	25-60
5	15-45
2.5	10-35
0.630	5-23
0.160	3-12
0.080	2-10

2102 GRAVELLED LANE GRAVEL

2102.1 CONSTRUCTING GRAVELLED LANES

Gravelled lanes shall be constructed using 50 mm crushed gravel, and shall have the following gradation limits:

TABLE 3: 50 MM CRUSHED GRAVELLED LANE GRAVEL GRADATION LIMITS

Sieve Size (mm)	Percent Passing Sieve Size
50	100
40	95-100
20	50-75
10	25-52
5	15-40
2.5	10-33
0.630	5-23
0.160	2-14
0.080	1-10

Aggregates shall exhibit the following physical properties:

(i) % Fracture, by weight (2faces) – 30 min

(ii) Los Angeles Abrasion, loss, % - 45 max.

(iii) Liquid Limit, % - 25 max.

(iv) Plasticity Index, % - 6 max.

(v) California Bearing Ratio, when compacted to 100% of ASTM 0698 – 40 min.

2103 NON-SHRINK FILL

2103.1 SPECIFICATIONS

.1 Compressive strength two (2) to five (5) MPa.

.2 Aggregate grading:

TABLE 4: AGGREGATE GRADING SPECIFICATIONS FOR NON-SHRINK FILL MATERIAL

Sieve Size (mm)	Percent Passing by Weight
5.0	55-100
2.0	37-67
0.08	0-30
PI	10 maximum

.3 Binder

(i.) Portland cement type 10 or Lime/Fly Ash.

2103.2 PLACING

Non-shrink Fill (N-S Fill) shall be cast on the compacted backfill from one meter below sub-grade to base of asphalt. N-S Fill shall be rodded or vibrated to eliminate voids, rough areas, honeycombing, and to ensure contact with the sides of the trench.

2104 CONTROL DENSITY FILL

2104.1 GENERAL

A flowable fill with self-levelling properties for trench backfill consisting of fine aggregate, sand, and cementitious content, the control density fill shall be resistant to settlement after hydration.

2200 BASE STABILIZATION

2201 SOIL CEMENT BASE COURSE

2201.1 DESCRIPTION

Soil cement base course consists of soil and Portland Cement uniformly mixed, moistened, compacted, finished, and cured in accordance with these Specifications, and it conforms to lines, grades, thickness, and typical cross-section shown or as directed by the Engineer.

2201.2 MATERIALS

2201.2.1 Portland Cement

Portland Cement shall meet the requirements of CAN3-A5-M77.

2201.2.2 Water

Water shall be free from substances deleterious to the hardening of soil cement, and be subject to the approval of the Engineer.

2201.2.3 Curling Seal

Curling seal shall be an emulsified asphalt, type RS-1H or RC-70.

2201.2.4 Soil

Soil consists of the material existing in the street to be paved, in an approved borrow pit, or a combination of these materials in a definite controlled proportion. The soil shall not contain gravel or stone retained on a 50 mm sieve or more than 45 percent retained on a 5.0 mm sieve.

2202 ASPHALT STABILIZATION

2202.1 DESCRIPTION

Asphalt stabilized base course consists of soil, crushed aggregate and emulsified asphalt uniformly mixed, moistened, compacted and finished in accordance with these Specifications, and it conforms to line, grade, thickness and typical cross-section shown or as directed by the Engineer.

2202.2 MATERIALS

2202.2.1 Emulsified Asphalt

SS-1 emulsified asphalt shall conform to the requirements of the Canadian Specification Board Specification for Emulsified Asphalt (16-GP-2).

2202.2.2 Water

Water shall be free from substances deleterious to the hardening of soil cement, and be subject to the approval of the Engineer.

2202.2.3 Soil

Soil consists of the material existing in the street to be paved, in an approved borrow pit, or a combination of these materials in a definite controlled proportion. The soil shall not contain gravel or stone retained on a 50 mm sieve or more than 45 percent retained on a 5.0 mm sieve.

2202.2.4 Aggregates

Aggregates shall conform to the gradation specified in section 2100 – Granular Material.

2202.3 MIX DESIGN

The amount of emulsified asphalt and soil/aggregate blends shall be established by the following tests:

ASTM Designation D915 Method of Testing Soil Bituminous Mixtures.

ASTM Designation D1560 Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus

ASTM Designation D1561 Preparation of Test Specimens of Bituminous Mixtures by Means of California Kneading Compactor.

2202.4 EQUIPMENT

Mixing and spreading shall be accomplished through the use of a rotary type mixer with transverse shafts that mix emulsified asphalt and soil/aggregate by revolving tines under a hood, preferably with an internal spray system which applies the emulsified asphalt while mixing. All equipment necessary for the proper construction of the base course shall be on the project and in satisfactory condition before construction begins.

2300 ASPHALT CONCRETE

2301 DESCRIPTION

Asphalt concrete consists of a hot mixed coarse aggregate and fine aggregate, with or without mineral filter, uniformly coated and mixed with asphalt cement in an approved mixing plant.

2302 PREPARATION FOR PAVING

2302.1 GENERAL

The hot asphalt mixture shall be laid upon a dry firm base, true to grade and cross-section and free from all screenings or other loose or foreign material. No hot mix shall be spread while the granular base or sub-base is wet or when other conditions prevent proper spreading, finishing, or compaction.

Existing asphalt surfaces and gutter areas shall be thoroughly cleaned of all loose or deleterious materials or objects prior to commencing either the levelling course or top lift paving operations.

Cleaning prior to paving shall be considered as incidental to the Unit Rate for asphalt concrete.

Granular materials and/or asphalt shall not be used as fill under full-depth asphaltic concrete paving unless positive drainage is provided. If extra material is required in order to bring the subgrade to the proper grade, the material shall be obtained from a suitable earth borrow area.

2302.2 PROCEDURE FOR PRIME COAT

Upon a uniformly damp base course, a prime coat of diluted SS-1 emulsified asphalt shall be uniformly applied as follows:

(i) Dilution rate: 2 parts SS-1 emulsion to 1 part water.

(ii) Distribution rate: 2.0 litres per square meter.

(iii) Emulsion temperature: 20°C to 50°C.

(iv) Ambient air temperature: shall be greater than 4°C.

(v) Curing time: a minimum of two hours. If weather or other conditions have been such that the prime coat has not fully cured at the end of two hours, the Engineer may extend the curing period as he/she deems necessary.

2302.3 PROCEDURE FOR TACK COAT

Tack coat shall be applied between successive lifts of asphaltic concrete, only after the surface has been cleaned of all loose or deleterious materials or objects, and as follows:

(i) Type: SS-1H emulsion

(ii) Distribution rate: not greater than 0.5 litres per square meter;

(iii) Emulsion temperature: 20°C to 50°C.

(iv) Ambient air temperature: shall be greater than 4°C.

2303 MANHOLES, VALVES, AND APPURTENANCES

The Contractor shall bring all manholes, water valves boxes and other appurtenance to the finished grade of the road or median strip at no cost to the County. This work shall be done in each individual block no later than one week after final paving operations have been completed in that block. The cost of repairing or replacing water valves, manholes and other appurtenances damaged as a result of the Contractors operation shall be borne by him. The final surface shall not vary more than 10 mm when checked with a 3 m straight edge. However, the County does not allow any tolerance for vertical drop of the finished surface in the vicinity of any utility appurtenance. The Contractor shall be responsible for correcting any irregularities in the final surface around ant utility appurtenance, at his expense and within the time specified by the Engineer.

Raising or lowering of manhole rims shall be done using precast collars, conforming to ASTM Designation C-139 along with an approved cement mortar. The completed work shall be in accordance with the Standard Specifications Sewer Construction. All work shall be subject to inspection and approval by the Engineer before it shall be considered complete.

Adjustment or sewer manholes shall be done in accordance with the following:

.1 All manhole adjustments shall be in accordance with the Standard Specification Wastewater Construction.

.2 Top lift paving shall not commence until all necessary manhole rebuilding has been done.

2304 MATERIALS

2304.1 PRODUCTS

.1 Performance Grade Binder, or approved alternative, shall be supplied in accordance with the binder grade specified in the Tender Form.

.2 Products shall meet the requirement of AASHTO M 320, "Standard Specification for Performance Graded Asphalt Binder".

.3 The minimum required Performance Grade Asphalt Binder shall be as per applications specified in Table 5 below.

TABLE 5: PERFORMANCE GRADE ASPHALT BINDER REQUIREMENTS FOR DIFFERENT ROAD CLASSIFICATIONS

Application	Traffic (20-year Design ESALs)	New Construction or Rehabilitation
Base Course Lift (All Roadway Applications)	N/A	PG 58-31
Surface or Binder Course (Residential & Non-Transit Collector)	N/A	PG 58-31
Surface or Binder Course (Transit Collector)	N/A	PG 64-34
Surface or Binder Course (Major with No Intersections)	< 5 million	PG 58-31
Surface or Binder Course (Major with Intersections)	< 5 million	PG 64-34
Surface or Binder Course (Major with No Intersections)	5 to 10 to million	PG 64-34
Surface or Binder Course (Major with Intersections)	5 to 10 to million	PG 70-31
Surface or Binder Course (Major with No Intersections)	> 10 million	PG 70-31
Bridge Mastic Asphalt	N/A	PG 70-40

Note: A 1°C tolerance for low temperature grading will be permitted for PG 58-31.
Binder course is a lift located directly below the surface course and above the base

2305 PRODUCTS

2305.1 MATERIALS

.1 Asphalt Binder

(i.) Coarse aggregate is aggregate retained on the 5.0 mm sieve; fine aggregate is aggregate passing the 5.0 mm sieve.

(ii.) Aggregate materials shall be crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps cementation, organic material, frozen material and any other deleterious material.

(iii.) Gradations to be within limits specified, when tested to ASTM C-136 and ASTM C-117 with sieve sizes to CAN/CGSB 8-Gp-2M rather than ASTM E11.

.2 Aggregate shall be processed to meet the following requirements:

(i.) Natural fines shall be pre-screened and stockpiled with not more than 10% of material retained on the 5.0 mm sieve and 100 % passing the 10.0 mm sieve.

(ii.) Aggregate delivered to the crushing plant shall be pre-screened and shall contain no more than 5% passing the 5.0 mm sieve.

.3 Crushed aggregates shall be separated and stockpiled in accordance with the following:

(i.) Coarse fraction to contain no more than 40 % of material passing the 5.0 mm sieve.

(ii.) Fine fraction or manufactured sand to contain no more than 20% of material retained on the 5.0 mm sieve.

.4 Physical properties of aggregates to meet the requirements in Table 6 below.

TABLE 6: AGGREGATE PHYSICAL PROPERTY REQUIREMENTS

Property	Test Standard	Requirement
Los Angeles Abrasion, Grading B (% Loss)	C131	30 max
Magnesium Sulphate Soundness (% loss)	C88	
Coarse Aggregate		12.0 max
Fine Aggregate		12.0 max
Lightweight Particles (5)	C123	1.5 max

.5 Flat and Elongated Particles: of coarse fraction (retained on 5.0 mm sieve size) the percentage of flat and elongated particles greater than a 5:1 ratio shall be by mass less than 10.0%

.6 Manufactured Sand (TLT 314): of total fine fraction (passing 5.0 mm sieve size), manufactured sand shall be by mass:

(i.) 20 mm NMS – 60 % minimum

(ii.) 12.5 m and 10 mm NMS – 70% minimum

.7 For mixes incorporating RAP, 50 % of the RAP sand portion shall be considered manufactured sand.

.8 The sand equivalent value (ASTM D2419, Mechanical Method) determined for the fine aggregate portion shall be:

(i.) 20 mm NMS – 40 % minimum

(ii.) 12.5 m and 10 mm NMS – 45% minimum

.9 The fine aggregate angularity (ASTM C1252, Un-compacted Void Content) of minus 2.5 mm fraction shall be:

(i.) 20 mm NMS – 40 % minimum

(ii.) 12.5 m and 10 mm NMS – 45% minimum

.10 Reclaimed Asphalt Pavement (RAP) may be used as follows:

(i.) A RAP portion of up to 20 % binder contribution, as a percent of the total binder content, will be allowed without the need for a binder rheology assessment.

(ii.) Other material additive will be considered subject to submission of a proposed binder rheology and/or aggregate assessment program, and subject to the approval of the County.

2305.2 MIX DESIGN

An asphalt mix design must be prepared and submitted to the County/Developer Designate for review and approval at least one week prior to the Work. The Contractor shall use qualified engineering and testing services licenced to practice in the Province of Alberta.

The trial mix design shall be performed in accordance with the AASHTO Designation M 323, Standard Practice for Superpave Volumetric Design for Hot Mix Asphalt.

2305.3 JOB MIX FORMULA

Subject to approval by the County/Developer Designate, the aggregate proportioning (including RAP), target gradation, asphalt content and air void content from the Mix Design will become the Job Mix Formula for the supply of hot mix asphalt.

Once established, no alteration to the Job Mix Formula will be permitted unless a new Job Mix Formula is submitted by the Contractor and approved by the County/ Developer Designate.

If the sum of any alteration to the Job Mix Formula is in excess of any one of the following limits, a new Mix Design shall be submitted for approval.

- +/- 5 passing the 5.0 mm sieve size
- +/- 1% passing the 0.080 mm sieve size
- +/- 0.3% asphalt content

Any alteration to the Job Mix Formula shall not result in properties which do not meet the requirements of this Specification.

Properties if the revised Job Mix Formula shall conform to all requirements of this Specification.

2400 STONE MATRIX ASPHALT

2401 GENERAL

2401.1 DESCRIPTION

This section specifies the requirements for the supply of Stone Matrix Asphalt (SMA) paving.

This Specification describes the mix property criteria and construction requirements for Stone Matrix Asphalt (SMA).

The work includes the supply of aggregate and asphalt binder, additive and liquid anti strip, where applicable; asphalt plant mixing, transporting, placement finishing, and compaction to all requirements of the Specification.

The work includes all materials certification, quality control, verification, and mix design testing, analysis, and reporting to be completed as required in the Specification.

2401.2 RELATED WORK

.1 Asphalt Binder

2401.3 DEFINITIONS

.1 Please refer to Section Specification Definitions.

2402 PRODUCTS

2402.1 MATERIALS

.1 Asphalt Binder

.2 Aggregates:

(i.) Coarse aggregate is aggregate retained on the 5.0 mm sieve; fine aggregate is aggregate passing the 5.0 mm sieve.

(ii.) Aggregate materials shall be crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps cementation, organic material, frozen material and any other deleterious material.

(iii.) Gradations to be within limits specified, when tested to ASTM C-136 and ASTM C-117 with sieve sizes to CAN/CGSB 8-Gp-2M rather than ASTM E11.

.3 Aggregate shall be processed to meet the following requirements:

(i.) Natural fines shall be pre-screened and stockpiled with not more than 10% of material retained on the 5.0 mm sieve and 100 % passing the 10.0 mm sieve.

(ii.) Aggregate delivered to the crushing plant shall be pre-screened and shall contain no more than 5% passing the 5.0 mm sieve.

2500 PORTLAND CEMENT CONCRETE

2501 GENERAL

Portland Cement Concrete specification provides the materials and testing requirement for the following classes of concrete:

(i) Concrete Sidewalk, Curb, and Gutter

(ii) Portland Cement Pavement

(iii) Architectural Pavements

(iv) Noise Barriers

2501.1 REFERENCE STANDARDS

Perform cast-in-place concrete work in accordance with the following standards, except where specified otherwise.

(i) CSA A3000-08, Cementitious Materials Compendium

(ii) CSA A23.1-09, Concrete Materials and Methods of Concrete Construction

(iii) CSA A23.2-09, Test Methods and Standard Practices for Concrete

(iv) CSA A283-06, Qualification Code for Concrete Testing Laboratories

2502 MATERIALS

2502.1 CEMENTING MATERIALS

Cement to CSA A3001-08, cementitious materials for use in concrete

(i) Type GU (general use cement);

(ii) Type HS (high sulphate-resistant cement), cementing materials combinations with equivalent performance may be used; and

(iii) Type HSb (blended high sulphate-resistant cement or approved equal).

2502.2 SUPPLEMENTARY CEMENTING MATERIALS

(i) Fly ash: to CSA A3001-08, Cementitious materials for use in concrete;

(ii) Type F with the additional requirement for maximum CaO content of maximum 12%

2502.3 AGGREGATE

2502.3.1 General

The Contractor is to submit the current results of the aggregate testing for each source of aggregate to be used under the Contract. The aggregate shall meet the requirements of CSA A23.1 Limits for Deleterious substances and physical properties of aggregate as per Table 7: Standard Aggregate Requirements below:

TABLE 7: STANDARD AGGREGATE REQUIREMENTS

Standard Requirements	Coarse Aggregate (%)	Fine Aggregate (%)	CSA Test Method
Clay Lumps	0.3	1.0	A23.2-3A
Low-Density Granular Materials	0.5	0.5	A23.2-4A
Material Finer than 0.08 mm	1.0	3.0	
Flat and Elongated Particles			
Procedure A, ratio 4:1	20	-	A23.2-13A
Procedure B, flat/elongated	25/45[1]	-	
Micro-Deval Test	17	20	A23.2-23A A23.2-29A
Unconfined Freeze-Thaw Test	6	-	A23.2-24A
Impact and Abrasion Loss	50	-	A23.2-16A A23.2-17A
$MgSO_4$ Soundness Loss (alternative requirement)	12	16	A23.2-9A

[1] For pavement and high-performance concrete maximum elongated particles in coarse aggregate is 40

All aggregate tests are to be conducted by an approved third party laboratory certified in accordance with CSA A283 to Category II. As a minimum, testing to verify compliance with the requirements of CSA A23.1 shall be done on a yearly basis.

All costs associated with aggregate testing shall be borne by the Contractor.

2502.3.2 Fine Aggregates

Normal density fine aggregate shall consist of natural sand, manufactured sand, or a combination of thereof.

Fine aggregate shall be graded to limits specified in CSA A23.1 Grading Limits for Fine Aggregate, Group FA1.

Fine aggregate tested in accordance with CSA A23.2-7A, test for organic impurities in fine aggregates for concrete, is to produce a color not darker than the standard color (organic Plate Number 3). Aggregate producing a color darker than the standard color will be rejected. The provision of CSA A23.1, Section 4.2.3.3.3.2 shall not apply.

2502.3.3 Coarse Aggregates

Normal density coarse aggregate shall consist of crushed stone, gravel, or a combination of these materials.

The sizes of coarse aggregate shall be selected from the standard sizes given in CSA A23.1, Grading Requirements for Concrete Aggregate, Group 1. The standard size of the coarse aggregate is 20 mm to 5 mm, except where specified otherwise.

2502.4 WATER

Water for concrete production and curing is to be clean and free from excessive amounts of oil, acid, alkali, soluble chlorides, organic matter, or sediment.

Any potable water is suitable for use in the concrete production. Water deemed not potable may be used in the concrete production provided that a satisfactory history of strength and durability of concrete made with the water has been demonstrated.

2502.5 ADMIXTURES

(i) Air entraining admixtures shall conform to the requirements of ASTM C-206

(ii) Water reducing admixtures and high range water reducing admixtures (*superplasticizers*) shall conform to the requirements of ASTM C-494.

(iii) Calcium chloride shall not be used as it promotes steel corrosion, if present, and reduces long-term sulphate resistance of concrete. Set accelerating admixtures shall only be used if approved by the County.

2502.6 FIBRES

2502.6.1 Synthetic Fibre

Synthetic fibre reinforcement shall meet the requirement of ASTM C-1116, 4.1.3, Type III, and shall be olefin macro fibres.

Macro synthetic fibre content shall be in the range of 1 kg/m^3 to 2 kg/m^3 for plastic shrinkage control and improved mechanical properties. Higher fibre volumes reduce workability and have a propensity to ball during mixing. When higher fibre content is required for a particular application, tests are necessary to verify that concrete with the desired amount of fibre can be properly mixed and placed.

Macro synthetic fibre length shall be between 38 mm and 50 mm.

2502.6.2 Steel Fibre

Steel Fibre reinforcement shall meet the requirements of ASTM C-1116, 4.1.1, Type I and shall be carbon steel.

Steel fibre content shall be a minimum 35 kg/m^3. Higher fibre volumes reduce workability and have a propensity to ball during mixing. When higher fibre content is required for a particular application, tests are necessary to verify that concrete with the desired amount of fibre can be properly mixed and placed.

Steel fibre length shall be between 38 mm and 50 mm and be continuously deformed or have ends mechanically deformed.

2502.7 CURING MEMBRANE

Liquid membrane forming curing compound to ASTM C-309.

(i) Type 1 – Clear translucent without dye; and

(ii) Type 2 – White pigmented.

Liquid curing membrane shall be applied to the concrete as soon as reasonable after the completion of and/or texturing activities. The time of the application shall not exceed 30 minutes after finishing.

2503 SUBMITTALS

(i) Submit the proposed mix design for all concrete mix types to the Engineer for approval four (4) weeks prior to the commencement of the Contract. Mix design documentation shall include all components of the mix and quantities of the materials used.

(ii) Submit copies of mill certificate test reports of cement and fly ash.

(iii) Submit the test results for each source of the aggregate to be used for compliance with the Aggregate section.

(iv) Submit data on all proposed concrete admixtures.

2504 CONCRETE SIDEWALK, CURB, AND GUTTER

2504.1 GENERAL

Portland concrete sidewalk, curb, and gutter, medians, traffic islands, gores, driveway crossings, and aprons shall be constructed in accordance with these Specification and the Standard Drawings. The type of construction used and the location shall be as shown on the construction plans, or as directed by the Engineer, and be in accordance with the provisions of this section.

Standard face curb shall be required around school and at bus stops.

Wheelchair ramps are compulsory at all intersection, where sidewalks cross wither curb and gutter or curb and at community mailbox locations.

The required mix properties shall be as shown in Table 8: Mix Properties of Concrete Sidewalk, Curb, and Gutter below:

TABLE 8: MIX PROPERTIES OF CONCRETE SIDEWALK, CURB, AND GUTTER

Type of Cement[1]	Supplementary Cementing Materials	Maximum Water to Cementing Materials Ratio	Nominal Maximum Coarse Aggregate Size	Air Content	Slump
GU, GUb, or HSb	Type F[2] Up to 20%[3]	0.45	20 mm	5% - 8%	As required by method of placement

[1] Minimum cementing materials content to achieve both strength and durability properties of concrete.

[2] CaO content to type F fly ash shall not exceed 12%

[3] By Mass of total cementing materials

The required performance characteristics shall be shown below.

TABLE 9: PERFORMANCE CHARACTERISTICS OF CONCRETE SIDEWALK, CURB, AND GUTTER

Compressive Strength at 28 days [1]	Maximum Air Void Spacing Factor
32 MPa	230 µm

[1] For concrete placed between September 30 and May 1, minimum specified compressive strength shall be achieved in seven days.

2505 FORMS

2505.1 FORMWORK

Forms for sidewalk, curb, and gutter, combined sidewalk curb, and gutter, aprons, invert crossing, and catch basins shall be of metal or timber properly seasoned and free from warps or other defect. Metal forms shall be of approved type and section. The face of curb form shall be removable without disturbing back and gutter forms. Forms shall be smooth and clean on the surface(s) next to the concrete and be oiled with an approved lubricant.

Forms shall be rigidly held true to the established lines and grades. No Concrete shall be deposited against forms until the forms and their placing has been approved by the Engineer.

2505.2 STRIPPING OF FORMS

Face of curb forms are to be removed after the initial set. Adequate care shall be taken in removing forms to avoid spoiling or marring the concrete. Such patching as may be necessary shall be started immediately after removal of the forms.

Immediately after form removal and/or patching, the exposed surfaces shall be sprayed with a curing membrane.

2506 REINFORCING

2506.1 GENERAL

When required by the Engineer, structure shall be reinforced in accordance with the drawings provided.

Cold drawn steel wire shall meet the requirement of ASTM designation A 82.

Wire mesh shall meet the requirements of ASTM designation A 185. Overlapping of wire mesh reinforcing shall be a minimum of 300 mm and be wired together.

Bar reinforcing shall meet ASTM Designation A 184 and ADTM Designation A 304 intermediate grade new billet deformed steel. Overlapping of bar reinforcing shall be 30 bar diameters and be wired together.

The mesh and/or bar reinforcing shall be supported above the compacted gravel base to ensure a minimum 50 mm cover of concrete. The manner of supporting the reinforcing shall be approved by the Engineer. Concrete with mesh wire position at the bottom of the concrete element shall be deemed unacceptable.

2506.2 WIRE MESH

A single layer of 150 mm by 150 mm No. 10 by 10 gauge wire mesh shall be installed in private residential driveway crossings and commercial sidewalks.

A double layer of 150 mm 150 mm, No. 10 by 10 gauge wire mesh shall be installed in public lanes and commercial driveway crossings.

The mesh shall extend the full width of the crossing. In aprons, the mesh shall extend to the full width, special attention being made that the mesh extends into the corners of the apron. All acute angle apron corners shall be constructed and reinforces as shown in the Standard Drawing section.

Reinforcing mesh shall be rolled or otherwise straightened to make a perfectly flat surface before placing.

2506.3 REINFORCING BARS

A 10 m reinforcing bar shall be installed, as shown in the drawings, in separate curb and gutter at all crossings.

2506.4 SYNTHETIC FIBRE CONCRETE

The Engineer may specify that synthetic fibre concrete be used instead of steel reinforces concrete.

2506.5 BULL NOSES ON MEDIAN

Where bull noses are to be constructed at the ends of medians, reinforcing bars may be left extending from the median in order to tie into the bull nose.

2507 CONCRETE PLACING

2507.1 GENERAL

The Contractor shall notify the Materials and Research dispatcher of ROADS of his intention to place concrete by 15:00 hours (3:00 pm) of the prior working day to permit arrangements to be made for the inspection and testing of the concrete. Contractor notification directly to a testing agency shall not relieve his obligation in this regard.

Advice as to work or the later than the following working day, except in the case of weekends, shall be taken as advice only and shall not constitute notification as required under this section.

2600 PORTLAND CEMENT PAVEMENT

2601 GENERAL

This specification covers the requirements for the construction of Portland Cement Concrete Pavement (PCC) for roadway applications to dimensions, line grades, and typical cross-sections as shown on the drawings.

2601.1 REFERENCE STANDARDS

(i) CSA A3000-08, Cementitious Materials Compendium

(ii) CSA A23.1-09, Concrete Materials and Methods of Concrete Construction

(iii) CSA A23.2-09, Test Methods and Standard Practices for Concrete

(iv) CSA A283-06, Qualification Code for Concrete Testing Laboratories

(v) Related Sections: Standard Specifications Roads Construction, Portland Cement Concrete.

2601.2 SUBMITTALS

(i) Submit the proposed mix design for PCC mix to the Engineer for approval four (4) weeks prior to the commencement of the Contract. Mix design documentation shall include all components of the mix and quantities of the materials used.

(ii) Submit copies of mill certificate test reports of cement and fly ash.

(iii) Submit the test results for each source of the aggregate to be used for compliance with the Aggregate section.

(iv) Submit data on all proposed concrete admixtures.

(v) Submit data on proposed fibres.

(vi) Submit the results of trial batch testing for each type of concrete for compliance with concrete properties specified in relevant sections of this Specification. Any change in the materials and/or quantities shall require a new trail batch test.

2602 MATERIALS

2602.1 CEMENTING MATERIALS

Cementing materials shall meet the requirements of Section 2502.1 - Cementing Materials.

2602.2 SUPPLEMENTARY CEMENTING MATERIALS

Supplementary cementing materials shall meet the requirement of Section 2502.2 Supplementary Cementing Materials.

2602.3 AGGREGATE

Aggregates shall meet the requirements of Section 2502.3 Aggregate.

2602.4 WATER

Water shall meet the requirements of Section 2502.4 Water.

2602.5 ADMIXTURES

(i) Admixtures shall meet the requirements of Section 2502.4 Admixtures. Admixtures containing calcium chloride shall not be used.

(ii) Calcium Chloride shall not be used in concrete pavement applications.

2602.6 FIBRES

Fibres shall meet the requirement of Section 2502.6 Fibres.

2602.7 CURING MEMBRANE

Curing membrane shall meet the requirement of Section 2502.7 Curing Membrane.

The application and dosage of the curing membrane shall follow the manufacturers recommendation for the product.

2602.8 JOINT MATERIALS

2602.8.1 Preformed Sealant

Preformed sealant shall conform to requirements of ASTM Designation D-1751

2602.8.2 Hot Pour Sealant

Hot poured sealants are asphalt-latex compounds conforming to the requirements of ASTM D-1190.

2602.9 REINFORCING

(i) Dowels and tie-bars shall conform to CSA G40.21.

(ii) Epoxy coated bars shall conform to ASTM A-775.

(iii) Smooth dowels shall be corrosion resistant, clean, straight, and epoxy coated steel bars, grade 300.

2700 FENCING

2701 GENERAL

Fencing shall be supplied and erected in accordance with the following Specifications and to line grade established by the Engineer. The Contactor shall be responsible for determining the location of all underground utilities prior to digging post holes.

Fencing shall be paid for at the Unit Rate measured in its erect position.

2702 BARBED WIRE FENCING

2702.1 MATERIALS

Fencing wire shall be “Four Point” 122 gauge galvanized strands. Diagonal bracing shall be 6 gauge soft galvanized wire. This bracing wire shall be doubled for all installations. Staples are 30 mm long galvanized steel.

Posts and braces shall be of pressure treated wood, with a minimum diameter of 100 mm. Posts and braces shall be two meters longs. Gate droppers shall be 1.4 long and shall be a minimum of 50 mm in diameter. Dressed lumber with nominal dimensions of 50 mm by 100 mm may also be used for gate droppers.

2702.2 INSTALLATION

Posts shall be installed a maximum of four meters apart, with the bottoms of the posts 750 mm below the finished grade line. The posts shall be shall be set and temped in a plumb and firm position.

Adjacent to each end gate, in each direction from a change in direction or an intersection of fences, a bracing panel two meters long shall be installed. If a tangent length of fencing exceeds 300 mm or a curved length of fencing exceeds 150 m, a bracing panel shall be installed.

Bracing panels shall have one brace post installed horizontally 150 mm from the top of the two fence posts. Bracing wire shall be run diagonally in both diagonals from the top of one post to the bottom of the other. Bracing shall be stretched.

Four strands of barbed wire are strung, with the wires located 150 mm, 450 mm, 750 mm and 1 m below the top of each post. Each wire shall be stretched and stapled to each post on the opposite side of the post to the roadway right-of-way.

Gates shall have barbed wire spacing the same as the rest of the fence. Droppers are spaced at a maximum of 2.5 m apart. At the hinge post, no dropper is required, as the wire may be connected directly to the gate post. At the fastening end of the gate the end dropper shall be connected to the gate post by the use of two wire loops, one at the bottom of the gate and one at the top.

2702.3 MAINTENANCE

The County shall not hold the Contractor responsible for damages resulting from traffic or malice following the issuance of the Construction Completion Certificate.

2702.4 ENDS, GATES, CORNERS, AND BRACES

Unless otherwise specified, end, gate, corner, and other bracing panels or gates, shall be included in the Unit Rate for fencing and no additional compensation shall be paid.

2703 CHAIN LINK FENCING

Materials Fence fabric shall conform to CGSB Standard CAN/CGSB-138.1-M, unless otherwise specified in the Contract Documents. If green, olive green, brown, or black colored vinyl-coated wire is specified, colors shall conform to ASTM Standard F-934.

Gates and gate hardware shall be as specified in CGSB Standard CAN/CGSB-138.4-M. Gate frames, in addition to meeting the minimum requirements of CGSB Standard shall be designed such that the outer member will not sag in excess of one percent of the gate leaf width or 50 mm, whichever is less. Gates shall be assembled with fabric mounted on the outside. Gate heights shall match fence heights unless otherwise specified. Gate sections three meters of more in width shall have three hinges per section.

All posts and rails shall be of Type “A” or Type “B” at the discretion of the Contractor.

The inner surface of Type “B” posts and rails shall have either a zinc coating as per ASTM F-1234, Type B, applied at an average rate of 305 g/m^2 and a minimum rate of 275 g/m^2 or an ASTM F-1234, Type D coating with a minimum zinc powder loading of 91% by weight and a minimum thickness of 0.075 mm. The inner coating shall have the ability to resist 650 hours of exposure to salt fog with a maximum 5% red rust when tested in accordance with ASTM B-117.

Fittings shall be constructed of aluminum or steel, as specified by ASTM Standard F-626. Fittings shall be of adequate strength for the intended purpose. Steel fittings shall be hot-dipped galvanized to achieve the same zinc coating at that required for Type “a” posts and rails.

2703.1 END, GATE, CORNER, AND STRAIN POSTS

Unless otherwise specified, end, gate, corner, and strain posts are paid for at the Unit Rate for the respective class of post, which shall include excavation and pouring of footings, supply and installation of posts, post tops, and braces.

Gates are paid for at the Unit Rate, which includes the supply and installation of the gate complete with hinges, latch, fabric, and miscellaneous material necessary for its completion. Gate terminal posts are paid for as gate posts.

2704 FENCE REMOVAL

Fencing shall be removed with care, avoiding damage to fence components. All salvageable material, as designated by the Engineer, shall be transported to a County storage area designated by the Engineer.

2705 FENCE REMOVAL AND RELOCATION

All fence designated for relocation shall be disassembled in a careful workmanlike manner. If required, the Contractor shall provide safe storage of the fence components. Any damaged or otherwise defective materials shall be replaces by the Contractor.

The fence shall be reassembled at the lines and grades established by the Engineer, to a standard similar to that of the fence removed. Any excess salvageable materials shall be transported to a County storage are designated by the Engineer.

2800 GUARDRAILS

2801 GENERAL

Guardrails shall be installed at locations as shown on the drawings, or as directed by the Engineer.

All terminal sections and approach end treatments are formed form the same material as rail elements. Installation at each location shall conform to the Standard Drawings.

Guardrails shall be paid for at the Unit Rate measured in tis erect position.

Unless otherwise specified, each “Approach/End Treatment” or “Attachment to Structures” shall be paid for ass a separate item of specified length.

2802 STEEL W-BEAM ON WOODEN POSTS

2802.1 MATERIALS

2802.1.1 General

Guardrail parts are standardized and are interchangeable with parts produced by guardrail manufacturers. Dimensions and details are shown on Standard Drawings.

2802.1.2 Rail

Rail elements are formed from open hearth or electric furnace steel and shall meet the following requirements:

(i) Gauge: 12 minimum

(ii) Tensile Strength: 550 MPa minimum

(iii) Elongation (ASTM): 12% minimum

(iv) DES: (E-8: 50 mm gauge length

The load shall be applied through a 75 mm flat surface at the centre of a freely supported 3.65 clear span and when the joint is tested it shall be at the centre of the span.

Max Deflection	Load Traffic Face Up	Load Traffic Face Down
70 mm	680 kg	550 kg
140 mm	900 kg	1,180 kg

Rail elements shall be galvanized to conform to the requirements for the Coating Class 2.50 of the current ASTM Designation A-525.

2802.1.3 Bolts

Bolts, nuts, and washers shall be galvanized to meet the requirements of ASTM Designation A-153. The post connection shall withstand a 2,250 kg side pull in either direction.

2802.1.4 Posts and Blocks

The wood posts and blocks shall be constructed with pine, and conform to No. 1 Structural Grade for posts and timbers as classified and defined by NGLA 1970, Standard Grading Rules for Canadian Lumber.

All posts and block shall be incised and pressure treated with Chromate Copper arsenate (CCA) to a minimum net retention of 6.4 kg/m^3 of wood (3.5 kg/m^3 for block), in accordance with CSA Standard 0.80.14: Pressure Preserved Wood for Highway Construction.

2802.1.5 Recycled Plastic

The use of recycled plastic posts and blocks shall be subject to the prior written approval of the Engineer.

2802.2 INSTALLATION

Posts shall be spaced on 1.9 m centres measured along the centerline of the rail. The rail elements shall be erected to produce a smooth continuous rail paralleling the line and grade of the highway surface or as shown on the plans. The rails elements shall be lapped in the direction of traffic. Terminal sections are attached to the ends of each installation.

2802.3 ATTACHMENT TO CONCRETE STRUCTURES

The rail elements are bolted to concrete structures as shown on the Standard Drawings for Steel W-Beams. In the vicinity of the structures the guardrail shall be strengthen by the addition of a 150 mm x 3.7 kg channel bolted to the wooden posts below the W-Bea, for aa distance of 7.6 m. This 150 mm x 3.7 kg channels shall be galvanized or metalized as specified below the steel box beam guard.

2803 STEEL BOX BEAM ON STEEL POSTS

Details of this guardrail are shown on the Standard Drawing for steel box beams.

2803.1 MATERIALS

There are three (3) types of materials as follows:

2803.1.1 Corten Grade “A” Steel

Corten Grade “A” Steel shall be in accordance with CSA. G-40.11 Grade A. Bolts for the connection of the steel to the structures shall be painted to match the matured Corten A color, the color of “Stelcoloy Weathering Steel – Halifax Rural” or approved equal.

2803.1.2 Metalized Steel

Metalized Steel shall be in accordance with Stelco 50 or approved equal, and with a minimum yield strength of 350 MPa.

Steel shall be field or shop metalized to provide a deposition of not less than 0.15 mm thickness of zinc on all surfaces 0.92 kg/m^2.

Work shall be in accordance with the requirements of the American Welding Society C2.2 "Recommended Practices for Metalizing, Part 1B – Application of Aluminum and Zinc for Protection of Iron and Steel," New York, 1952.

Surfaces to be metalized shall be cleaned by a dry blast process in accordance with the latest edition of CGSB Schedule 31-P-404, Classification 2.1.2 "Commercial Blast Cleaning".

Blast cleaning shall be carried out as such a rate that blast cleaned metal is not exposed for more than one hour prior to application of the spray metal coating.

The zinc coating shall be applied by wire or powder process and shall be of first class commercial quality, free from surface blemishes, breaks, etc. and of uniform thickness.

A thickness gauge shall be kept on hand at all times and coating thickness shall be checked as often as necessary to ensure uniformity Immediately after completion of a section of the railing the entire area shall be spot-checked with a magnetic thickness gauge and if thin spots are found additional metal shall be applied immediately.

2803.1.3 Galvanized Steel

Galvanized Steel shall be in accordance with Stelco 50 or approved equal, and with minimum yield strength of 350 MPs. Galvanizing of the box beam and posts shall conform to the requirements for the coating Class 0.6 liters per square meter of the current ASTM Designation A-525. Galvanizing of the bolts, nuts, and washes shall conform to the requirements of ASTM Designation A-153.

2803.2 INSTALLATION

Posts shall be spaced on 1.8 m centres measured along the centerline of the beam. In the vicinity of structures spacing can be closer as shown on the Standard Drawings for post installation. The beams are erected to produce a smooth continuous rail paralleling the line and grade of the highway surface or as shown on the plans.

2804 PRE-CAST CONCRETE GUARDRAIL

Details of this guardrail are shown on the Standard Drawings for standard concrete barrier.

2804.1 MATERIALS

2804.1.1 Concrete

(i) Concrete shall be a minimum of 35 MPa compressive strength at 28 days.

(ii) Cement shall be Type 30 Portland Cement meeting the requirements of CAN3-A5-M77.

(iii) Aggregate gradation shall conform to the requirements of ASTM Designation C33 – Fine Aggregate, Clause 3.

(iv) Coarse aggregate Size 67.

(v) Maximum water-cement ratio shall be 0.43

(vi) Slump shall be 75 mm maximum

(vii) Air entrainment shall be 6% minimum

(viii) Concrete shall also comply with Section 2500 - Portland Cement Concrete of the Specifications regarding entrained air spacing factor.

(ix) No calcium chloride shall be used

2804.1.2 Reinforcing Steel

Reinforcing steel shall be intermediate grade deformed bars meeting the requirements of ASTM Designation A-615, Grade 40.

2804.1.3 Miscellaneous Metals

Miscellaneous metals shall conform to the requirements of ASTM Designation A-36 or better.

2804.1.4 Air Entraining Agents

Air entraining agents shall conform to the requirements of ASTM Designation C-260.

2804.2 MIX DESIGN

Prior to any casting of guardrail, the proposed mix design including source of proposed aggregates shall be submitted to the Engineer for approval.

2804.3 TESTING

The manufacturer shall notify the Engineer of casting times in order that arrangements for concrete testing and/or inspection, at the expense of the County can be made. For this purpose, the supplier shall allow the Engineer free access to those portions of his plant where the guardrails are being produced and stored.

Concrete cylinders are tested in accordance with the following current ASTM standards:

(i) Moulding: ASTM Designation C-192

(ii) Curing: ASTM Designation C-31

(iii) Test for compressive strength: ASTM Designation C-39

2804.4 FORMS

Forms shall be true to shape, lines, and dimension as called for on the drawings. They shall be substantial and tight to prevent leakage of moisture. Maximum tolerance for final dimensions shall be +/- 5 mm.

2804.5 INSERTS

All inserts shall be paced accurately and securely in position by templates prior to concrete placement.

2804.6 CONCRETE COMPACTION

Concrete shall be thoroughly compacted by mechanical vibrators during casting. It shall be worked around reinforcement, embedded fixtures and into the corners of the forms. Vibrators are internal and/or form vibrators at the manufacturer's option.

2804.7 CURING

2804.7.1 Moist Curing

The surfaces of fresh concrete shall be kept continuously moist for a period of at least 7 days and are protected against the harmful effects of sunshine, drying winds, cold running water, surface water and mechanical shock. The temperature of the concrete shall be kept at 20°C for not less than 7 days.

2804.7.2 Steam Curing

If steam curing is used to maintain a doily cycle of casting, the following criteria for curing shall be adhered to:

(i) There shall be a minimum of 4 hours delay after final placing of the concrete prior to the application of steam

(ii) The maximum rate of temperature rise of the concrete shall be 20°C per hour.

(iii) The maximum temperature to which the concrete shall be raised is 70°C.

(iv) The maximum rate of cooling shall be 20°C per hour.

Immediately after stripping of forms, the members shall be moist or steam cured for an additional five days at a temperature of not less than 65°C.

After completion of moist or steam curing, the member are stored and allowed to dry out for a further period of 30 days prior to being put into service.

2804.8 PROTECTIVE COATINGS FOR METAL

Connector-lifting coupling inserts and threaded caps shall be completely galvanized.

2804.9 HANDLING, STORAGE, AND DELIVERY

Care shall be taken in the handling, storage, and delivery of completed pre-cast units to avoid damage. Damage to units prior to acceptance by the County at the point of delivery shall be rectified by the supplier at no extra cost to the County.

The units are delivered to the site of work as directed by the Engineer, and are unloaded and stacked at a specified location.

2804.10 INSTALLATION

Backfilled behind the guardrail shall be placed and compacted prior to placing pavement against the face of the guardrail.

Concrete slabs between the curb and the guardrail on guardrail taper sections shall be constructed as shown on the plans, and shall conform to the Specification for concrete sidewalk, concrete curb and gutter.

2805 CONCRETE GUARDRAIL

Concrete guardrail shall have a cross-section as shown on Standard Drawings.

Unless otherwise specified, the concrete levelling slab between the asphalt and the concrete guardrail (if required) shall not be considered incidental to the Unit Rate of concrete guardrail.

2805.1 MATERIALS

2805.1.1 Concrete

Concrete shall be Class “A” conforming to all Specifications for Portland Cement Concrete, found in Section 2500 - Portland Cement Concrete.

2805.1.2 Reinforcing Steel

Reinforcing Steel shall conform to ASTM Designation A-432, with deformations conforming to ASTM Designation A-305.

2805.1.3 Crushed Gravel

25 mm crushed gravel (*see Section 2100 - Granular Material*) shall be used to trim the sub-grade to the design line and grade.

2805.2 CAST IN-PLACE CONCRETE GUARDRAIL

2805.2.1 Length

Guardrail sections shall not exceed six meters in length.

2805.2.2 Joints

Joints between sections shall have joint filler and dowels installed as shown on the plans.

2900 GEOTEXTILES AND GEOMEMBRANES

2901 FILTER FABRICS

2901.1 GENERAL

Filter fabrics are divided into separation membranes and drainage membranes.

2901.1.1 Separation Membranes

Separation membranes shall be used to separate native soils from construction materials.

The fabric shall be woven polymer fibre having the following minimum properties:

Grab Tensile Strength	890 N
Puncture Strength	420 N
Mullen Burst Strength	2,900 kPa
Trapezoidal Tear Strength	400 N

2901.1.2 Drainage Membranes

Drainage membranes shall be used to filter excess water entering the drainage gravel and/or sub-drain from the sub-grade.

The fabric shall be non-woven polymer having the following properties:

Grab Tensile Strength	890 N
Mullen Burst Strength	2,000 kPa
Trapezoidal Tear Strength	270 N
Permeability K	0.1 cm/sec

2901.2 JOINTS

All fabric joints shall be sewn using a thread having equal or greater tensile strength than the fabric. Seams (joints) shall be double stitched using the “j” seam with interlocking stiches. The strength of the finished joint shall meet the same Specifications required for the fabric.

3000 SANITARY & STORM SEWER

3100 GENERAL

The following regulations and standards are referred to within these Specifications. In all cases, the most recent edition of these documents will govern.

Materials must conform to standards set out in these Specifications: Sanitary & Storm Sewer. Materials not listed may be acceptable on a product by product basis, however, prior to approval by the County will be required.

Upon request by a County representative, evidence shall be provided that material complies with these standard specifications.

Access to manufacturing facilities for inspection purposes shall also be provided if requested by a County representative.

3101 REGULATIONS

(i) Canadian Plumbing Code

(ii) Explosives Act (Canada)

(iii) Occupation Health and Safety Act, Regulation, and Code

(iv) Alberta Fire Code

3102 MATERIAL AND INSTALLATION STANDARDS

Canadian Standards Association (CSA):

A23.1	Concrete Materials and Methods of Concrete Construction
A23.2	Methods of Test for Concrete
CAN/CSA A257.3	Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings Using Rubber Gaskets
CAN/CSA A257.4	Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings
A3001	Cementous Materials for Use in Concrete
B182.1	Plastic Drain and Sewer Pipe and Pipe Fittings
B182.2	PVC Sewer Pipe and Fittings (PSM Type)
B182.4	Profile PVC Sewer Pipe and Fittings
B182.6	Profile Polyethylene Sewer Pipe and Fittings for Leak-Proof Sewer Applications

3200 MATERIALS

3201 APPROVED PRODUCT LIST

3201.1 PIPE

3201.1.1 Non-Reinforced Concrete Pipe

Approved Products:

Nominal Inside Pipe Diameter (mm)	Manufacturer/Supplier	
	Inland	**Lafarge**
300	Yes	No
375	Yes	No
450	Yes	No
525	Yes	No
600	Yes	No
675	No	No
750	No	No
900	No	No

3201.1.2 Reinforced Concrete Pipe

Approved Products:

Nominal Inside Pipe Diameter (mm)	Manufacturer/Supplier	
	Inland	**Lafarge**
300	Yes	Yes
375	Yes	Yes
450	Yes	Yes
525	Yes	Yes
600	Yes	Yes
675	Yes	Yes
750	Yes	Yes
900	Yes	Yes
1050	Yes	Yes
1200	Yes	Yes
1350	Yes	Yes
1500	Yes	Yes
1650	Yes	Yes
1800	Yes	Yes
1950	Yes	Yes
2100	Yes	Yes
2400	Yes	Yes
2700	Yes	Yes
3000	Yes	Yes

3201.1.3 Reinforced Concrete Box Conduit (Duct)

Approved Products:

Dimensions (mm)	Manufacturer/Supplier		
	Inland	**Lafarge**	**Proform**
1200x600	Yes	Yes	Yes
1200x900	Yes	Yes	Yes
1800x900	Yes	No	Yes
1800x1200	Yes	Yes	Yes
2400x1200	Yes	Yes	Yes
2400x1500	Yes	No	Yes
2400x1800	Yes	Yes	Yes
2400x2400	Yes	Yes	Yes
3000x1500	Yes	No	Yes
3000x2400	Yes	Yes	Yes
3600x3600	Yes	No	No

3201.1.4 PVC Pipe

Approved Products:

(i) PVC DR 35 Sewer Pipe (*PSM Type*) conforming to CSA-B182.2. Minimum Pipe Stiffness 320 kPa

Pipe Diameter (mm)	Manufacturer/Supplier				
	IPEX	**IPEX Enviro-Tite**	**Royal Flex-Lox** (Royal Building Products)	**Northern Pipe Products**	**NEXT Polymers**
100 (perforated)	Yes	No	Yes	Yes	Yes
150 (perforated)	Yes	No	Yes	Yes	Yes
150	Yes	Yes	Yes	Yes	Yes
200	Yes	Yes	Yes	Yes	Yes
250	Yes	Yes	Yes	Yes	Yes
300	Yes	Yes	Yes	Yes	Yes
375	Yes	Yes	Yes	Yes	Yes
450	Yes	No	Yes	Yes	Yes
525	Yes	No	Yes	No	No
600	Yes	No	Yes	No	No
675	Yes	No	Yes	No	No
750	Yes	No	No	No	No
900	Yes	No	No	No	No
1050	Yes	No	No	No	No

(ii) PVC DR 28 Sewer Pipe (*PSM Type*) conforming to CSA-B182.2. Minimum Pipe Stiffness 625 kPa.

Pipe Diameter (mm)	Manufacturer/Supplier				
	IPEX	**IPEX Enviro-Tite**	**Royal Flex-Lox** (Royal Building Products)	**Northern Pipe Products**	**NEXT Polymers**
100	Yes	Yes	Yes	Yes	Yes
150	Yes	Yes	Yes	Yes	Yes

(iii) PVC Strom Service Pipe (*PSM Type*) conforming to CSA-B182.1. Minimum Pipe Stiffness 275 kPa.

Pipe Diameter (mm)	Manufacturer/Supplier		
	IPEX	**Royal Flex-Lox** (Royal Building Products)	**NEXT Polymers**
75	Yes	Yes	Yes

3201.1.5 PVC Profile Pipe

Approved Products:

(i) Profile PVC PS 320 conforming to CSA-B182.4M. Minimum Pipe Stiffness 320 kPa

Pipe Diameter (mm)	Manufacturer/Supplier		
	IPEX Ultra-Rib Pipe	**IPEX Ultra-X2**	**Royal Building Products** (Kor-Flo Pipe)
200	Yes	No	Yes
250	Yes	No	Yes
300	Yes	No	Yes
375	Yes	No	Yes
450	Yes	No	Yes
525	Yes	No	Yes
600	Yes	No	Yes
750	No	Yes	Yes
900	No	Yes	Yes

3201.1.6 Polypropylene Profile Pipe

Approved Products:

(i) SaniTite HP polypropylene pipe conforming to CSA B182.13 as supplied by Advanced Drainage Systems (*ADS Canada*)

SaniTite HP Dual-wall	300 mm to 750 mm
SaniTite HP Triple-wall	750 mm to 1050 mm
	120 mm to 1500 mm accepted on a case-by-case basis only*

*Flexible pipe is limited to 1050 mm by Section 3.3.2.5 of the Stormwater Management and Design Manual (2011). A relaxation to this restriction must be requested and approval specifically granted by Water Resources, Development Approvals.

3201.1.7 HDPE Pipe

Approved Products:

(i) HDPE Pipe is not approved, except for service leads using pipe bursting, and for sanitary sewer forcemain applications.

(ii) HDPE pipe for sanitary sewer forcemain applications shall be Driscoplex by CP Chemical Performance Pipe, KWH Sclairpipe, PolyPipe by CS Rinker, or an approved equal. Electro-fusion fittings and processors shall be Friatec, Central Plastics, or an approved equal. The design and installation of HDPE pipe must be in compliance with the manufacturer's guidelines. HDPE fusion joints shall be made by factory trained or industry certified personnel using appropriate equipment, procedures, and fittings.

3201.1.8 Corrugated Metal Pipe

Approved Products:

(i) All corrugated metal pipe shall be approved by the Engineer and is only permitted for storm systems.

3201.2 SEWER PIPE JOINTS AND FITTINGS

3201.2.1 Concrete Box Conduit (Duct) Joints

Approved Products:

Joint Widths (mm)	Sikaflex Joint System
12 mm to 25 mm	1a
25 mm to 38 mm	2c

3201.2.2 Fabricated and Injection Molded Fittings for PVC Sewer Pipe

Approved Products:

Pipe	Fitting	Manufacturer/Supplier
Smooth Wall DR 35 & DR 28	Bends, Wyes Tees, and Inserta Tees (only for mains 375 mm and larger)	Galaxy Plastics Ltd., IPEX Inc., Inserta/Royal Building Products, GPK Products, Pro-Line Fittings Inc., or approved equal
Smooth Wall DR 35 & DR 28	100 mm x 100 mm Gasketed Repair Coupling 100 mm x 75 mm Reducer Coupling [A] 100 mm Spigot Plug 100 mm Gasketed Cap 100 mm 22.5° Bends (regular and extra-long), (GxS & GxG), 100 mm Wyes [B] and 100 mm Tees [B]	Royal Building Products, Galaxy Plastics Ltd., IPEX Inc., GPK Products, Pro-Line Fitting Inc.

[A] Only for connecting 75 mm service to main using Inserta Tee with gasketed bell section

[B] Only you install external cleanouts and a limited number of bends can be used for each service connection

See **Service Connectors** for service connections.

See **Manhole Connections** for manhole connection.

3201.2.3 Fabricated and Injection Molded Fittings for PVC Profile Sewer Pipe

Approved Products:

Pipe	Fitting	Manufacturer/Supplier
Profile PVC Sewer Pipe (PS 320)[D]	Bends, Wyes Tees, and Inserta Tees [C]	Galaxy Plastics Ltd., IPEX Inc., Inserta/Royal Building Products, GPK Products, Pro-Line Fittings Inc., or approved equal

[C] Only for Mains 250 mm service and larger

[D] Storm Sewer Construction only

Please see **Manhole Connections** manholes connections.

3201.2.4 Gaskets

Approved Products:

(i) PVC Pipe – Gaskets shall be supplied by the pipe manufacturer

(ii) Concrete Pipe – Rubber gaskets for concrete pipe shall be supplied by the pipe manufacturer

3201.2.5 Couplings for PVC Pipe

Approved Products:

Coupling	Manufacturer/Supplier
Fernco Flexible Coupling	Spectrum Sales Agency
Fernco RC Coupling	Spectrum Sales Agency
Rollee Swift Flexible Coupling	Spectrum Sales Agency
Flex-Seal Standard Rubber Coupling	Mission Rubber/ Vantage Marketing Inc.
Flex-Seal Adjustable Repair Coupling (ARC)	Mission Rubber/ Vantage Marketing Inc.
Flexible PVC Pipe Coupling	Dallas Specialty

3201.2.6 Mortar

Approved Products:

Product Name	Manufacturer	Manufacturer/Supplier
ThoRoc Plug (formerly Preco Plug)	ChemRex	Mountainview Systems

3201.2.7 Sewer Pipe Plugs

Approved Products:

(i) Sewer plugs shall be supplied by the pipe manufacturer and shall be compatible with the pipe joint.

3201.2.8 Crack and Joint Seal Repair Chemicals and Components

(i) Specifications and Standards

All sealing chemicals must conform to the latest applicable specifications and be installed according to the manufacturer's instructions.

(ii) Approved Products:

Polyurethane Sealing Chemicals (Sealing Products for use on concrete joints/cracks only).

Product Name	Manufacturer	Manufacturer/Supplier
Flex LV	De Neef Construction Chemicals	Cascade Aqua-Tech
CFL PURe	De Neef Construction Chemicals	Cascade Aqua-Tech
Cut	De Neef Construction Chemicals	Cascade Aqua-Tech
Prime-Flex 900 XLV Hydrophobic Grout*	Prime Resins	Martech
Prime-Flex 920 Hydrophobic Grout*	Prime Resins	Martech
Hyperflex Grout	Seal Guard	Spectrum Sales
Sealguard II Dual Components Grout	Seal Guard	Spectrum Sales

* All injection/pump applications for the Prime-Flex 900 XLV and 920 Grout products must be previously approved by the manufacturer, Prime Resins.
Contact the Prime Resins Technical Representative, Scott Kelly, at 1-800-321-7212 or pskelly@primeresons.com for a list of approved applicators.
Applicator approval by the manufacturer, Prime Resins, for the "cartridge program" presently in place with Wolseley Waterworks is not required.

3201.3 CASING SPACERS

3201.3.1 Casing Spacers for Carrier and Encasement Pipe

Approved Products:

Nominal Carrier Pipe Diameter	Spacer Length (min.)	Runner Width (min	Manufacturer/Supplier	Type/Model
150 -600 mm	200 mm	25 mm	BWM	SS-8
			APS	SSI-8
			CCI/ Pipeline Supply International	CSS8
			Silvertip/ Martech	SSBM8
600 -1200 mm	300 mm	50 mm	BWM	SS-12
			APS	SSI-12
			CCI/ Pipeline Supply International	CSS12
			Silvertip/ Martech	SSBM12

(i) The skid height shall be at least 10 mm > than the bell height

(ii) Non-metallic casing spacers (RACI and PSI) are permitted on a case-by-case basis only. Job specific County approval is required.

Carrier Pipe Nominal Inside Diameter (mm)	Encasement Pipe Minimum Nominal Diameter (mm)	
	PVC or Steel	**Concrete**
150	300	300
200	400	450
250	450	500
300	500	600
375	660	710
450	750	810
525	810	910
600	865	1015
675	965	1115
750	1220	1220
900	1270	1420
1050	1320	1575
1200*	1370	1625

*Carrier pipe greater than 1200 mm requires approval by the Engineer.

3201.3.2 End Seals for Encased Pipe

(i) Specifications and Standards

a.) End seals shall conform to standards ASTM D297, D395 D412, D2240, and form an air-water tight seal between casing and encased pipe.

(ii) Approved Products:

Type/Model	Manufacturer/ Supplier
Innerlynx End Seal	Hawkeye Industries Inc.

3201.4 SERVICES

3201.4.1 Service Lead Pipes

Approved Products:

Type of Lead	Diameter (mm)	Manufacturer/Supplier
Non-Reinforced Concrete	300	Inland
Reinforced Concrete	300 and 375	Inland, Lafarge
PVC DR 28	100 and 150	IPEX, Royal Building Products, NEXT Polymers
PVC DR 35	150, 200, 250, 300, and 375	IPEX, Royal Building Products, NEXT Polymers
PVC CSA B 182.1M	75 mm solid (weeping tile service only)	IPEX, Royal Building Products
PE DR 17*	100 and 150	Driscoplex by CP Chemical Performance Pipe, KWH Sclaipipe, PolyPipe by CS Rinker

*HDPE pipe is to be used only for pipe bursting se **Polypropylene Profile Pipe** and **HDPE Pipe**.

3201.4.2 Service Lead Jointing Material

Approved Products:

Type of Lead	Material	Manufacturer/Supplier
Non-Reinforced Concrete	Gasket	Inland
Reinforced Concrete	Gasket	Inland, Lafarge
PVC DR 28	Gasket	IPEX, Royal Building Products, NEXT Polymers, Pro-Line Fittings Inc.
PVC DR 35	Gasket	IPEX, Royal Building Products, NEXT Polymers, Pro-Line Fittings Inc.
PVC (75 mm)	CSA B182.1M Solvent Weld	--

3201.4.3 Service Lead Bends, Adapters, and Fittings

Approved Products:

(i) All bends, adapters and fittings shall be supplied by the service lead manufacturer and approved by the Engineer.

3201.4.4 Service Connectors

Approved Products:

Type of Sewer Main	Approved Connectors	Manufacturer/Supplier
PVC	Strap-on Saddle-Tee or Wye	IPEX Inc., Multi Fittings Inc., DFW Plastics Inc., Tigre Galaxy Plastics (distributor of Tigre), GPK Products, Pro-Line Fittings Inc., Royal Building Products
	Flexible Saddle	DFW Plastics Inc., Mission Rubber Co.
	FAT BOY Inserta Tee (only for mains 375 mm or larger)	Royal Building Products, Pro-Line Fittings Inc.
	EZ Tee – Inserta Tee (only for mains 375 mm or larger)	Galaxy Plastics Ltd.
	Inserta Tee (only for mains 375 mm or larger)	Inserta Fittings Co., Pro-line Fittings Inc.
	Inline Tee or Wye	Galaxy Plastics Ltd., IPEX Inc.
Profile PVC	FAT BOY Inserta Tee (only for mains 250 mm or larger	Royal Building Products, Pro-Line Fittings Inc.
	EZ Tee – Inserta Tee (only for mains 250 mm or larger)	Galaxy Plastics Ltd.
	Inserta Tee (only for mains 250 mm or larger)	Inserta Fittings Co., Pro-line Fittings Inc.
Concrete	Strap-on Saddle-Tee or Wye	IPEX Inc., Multi Fittings Inc., DFW Plastics Inc., Tigre Galaxy Plastics

Type of Sewer Main	Approved Connectors	Manufacturer/Supplier
		(distributor of Tigre), GPK Products, Pro-Line Fittings Inc.
	Flexible Saddle	DFW Plastics Inc., Mission Rubber Co.
	Core-Bell Concrete Adapter (only for mains 450 mm or larger)	Galaxy Plastics Ltd.
	Concrete Tapping Adapter (Kipper)	Royal Building Products, Multi Fittings Inc.
	TwisTee	Mission Rubber Co.
Asbestos Cement	Strap-on Saddle-Tee or Wye	IPEX Inc., Multi Fittings Inc., DFW Plastics Inc., Tigre Galaxy Plastics (distributor of Tigre), GPK Products, Pro-Line Fittings Inc.
	Flexible Saddle	DFW Plastics Inc., Mission Rubber Co.
Clay Tile	Strap on Saddle-Tee or Wye	IPEX Inc., Multi Fittings Inc., DFW Plastics Inc., Tigre Galaxy Plastics (distributor of Tigre), GPK Products, Pro-Line Fittings Inc.
	Flexible Saddle	DFW Plastics Inc., Mission Rubber Co.

3201.4.5 Connector Sealants

Approved Products:

(i) Approved sealants fir binding PVC saddles to concrete or clay tile sewer mains:

Sealant	Manufacturer/ Supplier	Ambient Temperature
Femco/Predco Epoxy Kit	Tridon Ltd.	Greater than 0°C
Permaseal HV	Chemtron	20°C - 40°C

3201.5 MANHOLES

3201.5.1 Manhole Covers

Approved Products:

Type of Cover	Manufacturer/Supplier
Standard Manhole Cover	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Seals Ltd., Sigma Corporation, EJ
Standard Manhole Cover c/w locking Device	Trojan Industries Inc., Westview Sales Ltd.
Grated Manhole Cover	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Seals Ltd., Sigma Corporation, EJ

3201.5.2 Manhole Frames

Approved Products:

Type of Frame	Manufacturer/Supplier
Standard Manhole Frame	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Seals Ltd., Sigma Corporation, EJ
90 mm Shallow Manhole Frame	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Seals Ltd.
150 mm Shallow Manhole Frame	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Seals Ltd., Sigma Corporation
Manhole Frame Safety Grating	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Seals Ltd.
Manhole Frame Riser*	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Seals Ltd.
Adjustable Manhole Frame	Trojan Industries or approved equal

*Only permitted for re-surfacing on existing roads with County approval. Not to be used for new construction.

3201.5.3 Manhole Collars

Approved Products:

(i) Precast Manhole Collars

Height (mm)	Manufacturer/ Supplier			
	Inland	**Lafarge**	**Precon**	**Proform**
50	Yes	Yes	Yes	Yes
75	Yes	Yes	Yes	Yes
100	Yes	Yes	Yes	Yes
150	Yes	Yes	Yes	Yes
200	Yes	Yes	No	No

3201.5.4 Manhole Slab Tops

Approved Products:

Type of Slab Top	Manufacturer/Supplier
Manhole Slab Top	Inland, Lafarge, Precon
Manhole Slab Top for Spigot-Up Installations	Inland, Lafarge, Proform, Precon
Manhole Slab Top for Large Diameter Round Manhole	Inland, Lafarge, Proform, Precon

3201.5.5 Manhole Risers

Approved Products:

(i) Manhole Risers

Height (mm)	Manufacturer/ Supplier		
	Inland	**Lafarge**	**Precon**
300	Yes	Yes	Yes
400	Yes	Yes	Yes
800	Yes	Yes	Yes
1200	Yes	Yes	Yes
1600	No	No	No
2000	Yes	No	Yes
2440	Yes (2500 mm)	Yes	No

(ii) Manhole Risers for Spigot-Up Installations

Height (mm)	Manufacturer/ Supplier			
	Inland	**Lafarge**	**Precon**	**Proform**
300	Yes	Yes	Yes	Yes
400	Yes	Yes	Yes	Yes
800	Yes	Yes	Yes	Yes
1200	Yes	Yes	Yes	Yes
1600	No	No	Yes	Yes
2000	Yes	No	Yes	Yes
2440	Yes (2500 mm)	Yes	No	Yes

3201.5.6 Manhole Adaptor Barrels

Approved Products:

Type of Adaptor	Manufacturer/Supplier	Height (mm)
Spigot-Spigot Adaptor	Inland	184
	Lafarge	305
	Proform	305
Bell-Bell Adaptor	Inland	508
	Lafarge	406
	Proform	406

3201.5.7 Manhole Steps

Approved Products:

Type of Step	Manufacturer/ Supplier
Aluminum	MSU Mississauga Ltd. (Models 350 and 360)
Galvanized Steel	Inland, Lafarge, Precon, Proform

3201.5.8 Manholes

Approved Products:

(i) Precast Type 1-S Manhole

Manufacturer	Dimensions (mm x mm)
Inland	1220 x 1220
	1525 x 1525
	1830 x 1830
	1980 x 1980
	2440 x 2440
	2800 x 2800
Lafarge	1220 x 1220
	1500 x 1500
	1930 x 1930
	2400 x 2400
	2800 x 2800
Precon	1220 x 1220
	1525 x 1525
	1830 x 1830
	1830 x 2440
	2500 x 3000
	3000 x 4000
Proform	1220 x 1220
	1525 x 1525
	1830 x 1830
	2135 x 2135
	2440 x 2440
	2440 x 3050
	2745 x 2745
	3050 x 3050
	2660 x 3660

(ii) Precast T-Riser Manhole

Pipe Diameter (mm)	Manufacturer/ Supplier	
	Inland	**Lafarge**
1050	Yes	No
1200	Yes	Yes
1350	Yes	Yes
1500	Yes	Yes
1650	Yes	Yes
1800	Yes	Yes
1950	Yes	Yes
2100	Yes	Yes
2400	Yes	Yes
2700	Yes	Yes
3000	Yes	Yes

(iii) Large Diameter Round Manholes

Vault Diameter (mm)	Manufacturer/ Supplier			
	Inland	**Lafarge**	**Precon**	**Proform**
1500	Yes	Yes	Yes	Yes
1800	Yes	Yes	Yes	Yes

(iv) Field Cast and Control (*Test*) Manholes

Type of Manhole	Manufacturer
Type 5A – Exterior Drop	--
Type 5A – interior Drop	--
Type 5A – Box Conduit (Box)	--
Type 1	--
Test Manhole	--
Precon Test Manhole – Pre-bench	PRECON Precast
Sampling Chamber	--
Skimming Manhole	--

3201.5.9 Manhole Bases

Approved Products:

Type of Manhole		Manufacturer
Precast Bases	Type 5A	Inland
		Lafarge
		Precon
	Type 5A – Spigot-Up Installations	Inland
		Lafarge
		Precon
	Type 5A – Spigot-Up Installations	Proform (octagonal)
	Type 5A – Sampling Chamber	Lafarge
	Type 5A – Pre- Bench Spigot-Up Monolithic Manhole	Inland
		Lafarge
		Precon
		Proform
Field Cast Bases	Type 5A	--
	Skimming Manhole	--

Note: Inland is approved for 3/4 deep pre-benched base.

3201.5.10 Manhole Connections

Approved Products:

(i) Rubber gaskets for connecting PVC pipe to manholes and catch basins.

Manufacturer/Supplier	Integral Gasket	Gasket
Press-Seal Gasket Corporation	Cast-a-Seal 603	Kwik Seal
Press-Seal Gasket Corporation	PSX: Direct Drive	PSX: Direct Drive
Hamilton Kent	--	Cobra Style
Hamilton Kent	--	Adjustable Style
A-Lok Products Inc.	A-Lok Premium	--

(ii) Manhole connectors for Ultrarib PVC pipe (*storm sewer only*)

Pipe	Fitting	Manufacturer/Supplier
Ultrarib PVC Pipe Connections to Manholes (B x DR 35)	Manhole Connector	IPEX Inc.

3201.5.11 Manhole Barrel Jointing Material

Approved Products:

(i) Material supplied or recommended by the manufacturer and approved by the Engineer shall be used on each barrel joint.

Approved Material	Manufacturer/Supplier
Rubber Gasket	Concrete Pipe Plant
Rub'r-Nek	Henry Company
Kent Seal	Hamilton Kent

3201.5.12 Manhole Barrel Jointing Material

Approved Products:

Product Name	Manufacturer	Manufacturer/Supplier
ThoRoc Plug (formerly Preco Plug)	ChemRex	Mountainview Systems

3201.6 CATCH BASINS

3201.6.1 Catch Basin Side Inlet

Approved Products:

Type of Side Inlet	Manufacturer/Supplier
Side Inlet Type 'C'	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Sales, Ltd.
Two Piece Side Inlet Type 'C'*	Sovereign Castings Inc., Trojan Industries Inc., Westview Sales, Ltd.

*Two Piece Side Inlet Type 'C' is required on all freeways, major roads, collector roads, bus routes, and any road where snow clearing occurs.

3201.6.2 Catch Basin Grates

Approved Products:

Type of Grate	Manufacturer/Supplier
Type 'C' Grate*	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Sales, Ltd.
Type 'K-2' Grate	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Sales, Ltd.

*Type K-3 catch basin utilizes a Type 'C' grate

3201.6.3 Catch Basin Frames

Approved Products:

Type of Frame	Manufacturer/Supplier
Type 'C' Frame*	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Sales, Ltd.
Type 'K-2' Frame	Norwood Foundry Ltd., Sovereign Castings Inc., Trojan Industries Inc., Westview Sales, Ltd.

*Type "K-3" catch basin utilizes a Type 'C' frame

3201.6.4 Catch Basin Tops

Approved Products:

Type of Top	Manufacturer/Supplier
Precast Top for Type 'C' Catch Basin	Inland
	Lafarge
	Proform
	Precon
Alternate Precast Top for Type 'C' Catch Basin in Low Profile Rolled Curb	Inland
	Lafarge
Precast Slab Top for Type 'K-2' Catch Basin	Inland
	Lafarge
	Proform
	Precon
Precast Slab Top for Type 'K-3' Catch Basin	Inland
	Lafarge
	Proform
	Precon

3201.6.5 Catch Basin Collars

Approved Products:

Type of Collar	Manufacturer/Supplier
Concrete Catch Basin Collar for Type 'K-3' Catch Basin	Lafarge (67 mm)
	Proform (50, 75, 100, 150 mm)
Precast Collar for Type 'K-2' Catch Basin	Inland (100 mm)
	Proform (50, 75, 100 mm)

3201.6.6 Catch Basin Barrels

Approved Products:

(i) Precast Catch Basin Barrels

Height (mm)	Manufacturer/ Supplier			
	Inland	**Lafarge**	**Precon**	**Proform**
150	Yes	Yes (152 mm)	No	No
300	Yes	Yes (305 mm)	No	No
450	Yes	Yes (457 mm)	No	No
600	Yes	Yes (610 mm)	Yes	No
762	No	Yes	No	No
914	No	Yes	No	No
1050	Yes	Yes (1067 mm)	Yes (1067 mm)	Yes (1000 mm)

3201.6.7 Catch Basin Bases

Approved Products:

Type	Manufacturer/Supplier
Precast Monolithic Catch Basin Base	Inland
	Lafarge
	Proform
900 mm Monolithic Catch Basin (Schlusselbauer Process)	Inland

3201.6.8 Catch Basin Leads

(i) Approved Products:

Type of Catch Basin	Size of Lead (mm)	Material	Manufacturer/Supplier
Single Catch Basin	250	PVC	IPEX, Royal Flex-Lox, NEXT Polymers
		Profile PVC*	IPEX Ultrarib*, Royal Pipe Kor Flo
Double Catch Basin	300	PVC	IPEX, Royal Flex-Lox, NEXT Polymers
		Reinforced Concrete	Lafarge, Inland
		Profile PVC*	IPEX Ultrarib*, Royal Pipe Kor Flo
Interconnected Catch Basin	300	PVC	IPEX< Royal Flex-Lox, NEXT Polymers
		Reinforced Concrete	Lafarge, Inland
		Profile PVC*	IPEX Ultrarib*, Royal Pipe Kor Flo

*Storm system construction only

3201.6.9 ICDs

(i) Specifications and Standards:

ICD material to be 6 mm gauge PVC/fiberglass or equivalent stainless steel.

(ii) Approved Products:

Type of ICD	Size (mm)	Manufacturer/Supplier
Curved Plat	R30	**PVC** – IPEX, Pro-Line Fittings, Galaxy Plastics **Stainless Steel** - Lafarge
	R50	
	R70	
	R100	
Flat Plate	R30	**PVC** – IPEX, Pro-Line Fittings, Galaxy Plastics **Stainless Steel** - Lafarge
	R50	
	R70	
	R100	

3201.7 WARNING TAPE

Approved Products:

Type/Model	Manufacturer/Supplier
MTP 61000*	ACP International
Magnatec	Empire
10314xxx3	Pro-line Safety Products*

*Or approved equal

3201.8 OIL-GRIT SEPARATORS AND OIL WATER INTERCEPTORS

(i) Specifications and Standards:

An average annual Total Suspended Solids (TSS) removal rate of 85% for particle sizes 50μm and greater is required for each year of the period of record.

(ii) Approved Products:

Type of Oil Grit Separator	Manufacturer/Supplier
Stormceptor	Imbrium Systems
Vortechs	CONTECH Stormwater Solutions
CDS	CONTECH Stormwater Solutions
Downstream Defender	Hydro International
AFC (Oil-Water Interceptor)	American Forcecrete of Canada

*Catch basin-types of Oil-Grit Separators are not approved.

3201.9 LIST OF SUPPLIERS

Supplier	Contact Information
ACO Polymer Products	www.acousa.com | 918-258-3517
Advance Products and Systems	www.apsonline.com
A-LOK Products Inc.	www.a-lokl.com | 918-258-3517
American Forcecrete of Canada (APS) Inc.	www.ascinc.ca
Canada Pipeline Accessories (1986) Corp.	www.canadapipeline.com
Cascade Aqua-Tech	www.cascadeaqua.com
CCI Pipeline Systems	www.ccipipe.com
Chemtron Manufacturing Ltd.	www.chemtron.ca
CONTECH Stormwater Solutions	www.contech-cpi.com
Dallas Specialty	www.dalspc.com
Degussa Building Systems	403-807-9800
DFW Plastics Inc.	www.dwfplastics.com
Fernco Connectors Ltd.	
Galaxy Plastics	www.galaxyplastics.com
GPK Products Inc.	www.gpk-fargo.com
Hamilton Kent	www.hamiltonkent.com
Hawkeye Industries Inc.	www.hawk-eye.com
Imbrium Systems	www.imbriumsystems.com
Inland Pipe Limited	www.inlandcanada.com
IPEX Inc.	www.ipexinc.com
J-Four and Hoff Company Ltd. (Broken Arrow, OK)	
KWH Pipe	www.kwhpipe.ca
Lafarge Canada Inc.	www.lafargepipe.com
Martech	www.martechmarketing.com

3202 SEWER PIPE

3202.1 CONCRETE PIPE

Concrete sewer pipe used in sewer construction shall be manufactured from sulphate resistant cement Type HS (Type 50) in accordance with CSA A3001 or Type V in accordance with ASTM C150. All concrete structures shall be designed for CL-800 truck loading as per CSA-S6-00 (Canadian Highway Bridge Design Code).

3202.1.1 Non-Reinforced Concrete Pipe

Non-reinforced concrete pipe shall conform to ASTM C14/C14M. All pipe shall be subject to such test as outlined under ASTM Specifications and evidence shall be submitted to the County.
For approved material list see **Non-Reinforced Concrete Pipe**.

3202.1.2 Reinforced Concrete Pipe

Reinforced concrete pipe 900 mm and smaller shall conform to ASTM C76/C76M (reinforced Concrete Culvert, Storm Drain, and Sewer Pipe) and shall be designed according to the manufacturer's recommendation. All pipe shall be subject to test outlined under ASTM Specifications and evidence shall be submitted to the County.

Reinforced concrete pipe sizes 1050 mm and larger may be designed by direct design methods in accordance with the American Society of Civil Engineers (ASCE) Standard Practice for Direct Design of Buried Precast Concrete Pipe using Standard Installations (SIDD) 15, and shall conform to ASTM C1417.

Reports shall be provided to the Engineer showing that the manufacturer of concrete pipe has completed the reinforced concrete design by direct design methods in accordance with ASCE SIDD No. 15. The manufacturer will also provide written certification that the product meets the design carried out by the original design engineers responsible for the project.

For approved materials list please see **Reinforced Concrete Pipe.**

3202.2 REINFORCED CONCRETE BOX CONDUIT (DUCT)

Concrete box conduit shall be manufactured from sulphate resistant cement Type HS (Type 50) in accordance with CSA A3001 or Type V in accordance with ASTM C150.

Reinforced concrete box conduit shall conform to ASTM C1433 or ASTM C1433M. Physical properties testing shall be provided as specified in ASTM C1433 or ASTM C1433M and a certified copy of the test results shall be provided to the County.

Coated supports and spacers shall be used as approved by the Engineer to minimize the potential for rust staining on the concrete surfaces on the inside of the box conduit.

Concrete box conduit shall be design to resist all loads, including dead loads, earth loads including lateral pressures, internal and external hydrostatic loads, vehicle loads, and any other loads specified on the approved construction drawings. When requested by the Engineer, a copy of concrete box conduit designs stamped and signed by a Professional Engineer registered with APEGGA shall be submitted.

Concrete box conduit joints shall be sealed using Sikaflex products or an alternate product approved by the County. (see **Concrete Duct Joints**).

For an approved materials list see **Reinforced Concrete Box Conduit (Duct).**

3202.3 PVC PIPE

All PVC pipe shall be CSA approved. Materials used for pipe shall come from a single compound manufacturer and have a cell classification of 12454-B, 12454-C, or 12364-C as defined in ASTM D1784 (Rigid PVC Compounds and CPVC Compounds).

All PVC pipe shall meet the physical requirements given in CSA B182.1M (Plastic Drain and Sewer Pipe and Pipe Fittings), CSA B182.2M (PVC Sewer Pipe and Fittings). All pipe shall be subject to such teste as required in the CSA standards and results for specific pipe data shall be submitted to the County if requested.

PVC Shall be installed according to ASTM D2321 (Underground Installation of Flexible Thermo-Plastic Sewer Pipe).

For an approved materials list see **PVC Pipe.**

3202.4 CORRUGATED METAL PIPE

All materials shall conform to the CSA G401 and shall be subject to such tests as outlined in that standard.

Corrugated metal pipe shall only be used for storm sewer mains to which there are no direct connections from catch basins or house services (weeping tile drains), and only where specifically approved for use by the County.

3202.4.1 Materials

(i.) Pipe

Pipe shall have helical corrugated lock seams with ends re-corrugated to provide annular corrugations for couplers. Riveted pipe is not accepted.

(ii.) Couplers

Couplers shall be of sufficient length so as to extend over a minimum of 2 complete corrugation crests and valleys on each pipe end, and shall be capable of providing a water tight joint when installed with gaskets in accordance with the manufacturer's recommendations.

The coupler shall have a sufficient number of closure bolts such that when the coupler is drawn closed all parts of the coupler have uniform tension and there is no wrapping or distortion on any part of the coupler

Couplers must be supplied by the pipe manufacturer.

(iii.) Gaskets

Gaskets shall be one-piece sleeve or wrap-around strip type, supplied by the pipe manufacturer, or sufficient thickness to fill the annular space between the pipe and coupler to provide an effective water tight joint.

3202.5 PROFILE PIPE

3202.5.1 PVC Profile Pipe

Profile PVC storm sewer pipe shall be CSA certified and shall conform to CSA B182.4 (Profile PVC pipe and Fittings), and shall be subject to such tests as outlined under the standard. Materials used for pipe and fittings shall come from a single compound manufacturer and have a cell classification of 12454-B, 12454-C, or 12364-C as defined in ASTM D1784 (Rigid PVC Compounds and CPVC Compounds).

Profile PVC pipe shall conform to ASTM F794 (Standard Specification for Poly Vinyl Chloride (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter).

PVC Profile Pipe is to be used in storm system construction only.

For approved materials list see **PVC Profile Pipe.**

3202.5.2 Polypropylene Profile Pipe

Profile Polypropylene Pipe shall conform to CSA B182.13 and shall be subject to such tests as outlined under the standard. Materials used for pipe and fittings shall come from a single compound manufacturer.

Polypropylene Profile Pipe is to be used in storm sewer system construction only.

SaniTite HP shall be dual-wall for sizes 300 to 750 mm, and triple-wall for sizes 750 to 1500 mm.

Polypropylene Profile Pipe requires a maximum aggregate size of 20 mm for pipe embedment of all sizes of dual-wall pipe up to the maximum pipe size of 750 mm. 120 mm to 1500 mm pipe sizes are permitted only with approval on a case by case basis.

For an approved materials list see **Polypropylene Profile Pipe.**

3202.6 HDPE PIPE

HDPE Pipe products are not approved for use except for service leads using pipe bursting. (see **HDPE Pipe Bursting Procedure for Replacing Sanitary Services**), and for sanitary sewer forcemain applications.

For service lead applications using pipe bursting, HDPE materials for pipe and fittings shall come from a single compound manufacturer and conform to ASTM D3350. Closed and open profile pipe products and fittings shall conform to sections 4 and 5 of CSA B182.6 and CSA 182.8 for manufactured quality and dimensional tolerances. Resin compounds shall be tested for slow creak growth resistance as per Appendix SP-NCTL in ASTM D5397 as modified in Clause 8.8 of CSA B182.8.

For sanitary sewer forcemain application, HDPE pipe and fittings shall conform to the AWWA C906-99 Standard and shall be PE 32408 with a dimension ratio (DR) 11 and working pressure rating (WPR) 160 psi, unless otherwise approved.

For sanitary sewer forcemain applications, please refer to the **Standard Specifications: Waterworks Construction**. The following exception to the Waterworks Specification shall apply: HDPE pipe for sanitary sewer forcemain use must be identified by green longitudinal printing, striping, or a green outer shell.

The outside diameter (OD) shall conform to ductile iron (DIPS) unless otherwise approved by the Engineer. HDPE project design shall conform to the design principals outlines by AWWA M55 Design Manual.

Operator certification for each fusing method employed on a project shall be presented for inspection and shall have a date no more than one calendar year previous to be considered valid. All butt and electro-fusion shall be performed in the presence of the Engineer unless otherwise approved. Microprocessor fusing logs shall be submitted to the Engineer for every butt fuse made, and for each electro-fuse fitting where used. Butt fusing shall bot commence onsite until the Fusing Operator has successfully completed a “Bent Strap” test (as per the Plastics Pipe Institute Handbook) to the satisfaction of the Engineer.

3203 SEWER PIPE JOINTS, FITTINGS, AND CASING SPACERS

3203.1 GASKETS

3203.1.1 Gaskets for PVC Pipe

Gaskets shall be supplied by the manufacturer. All gaskets shall conform to ASTM F477 (Elastomeric Seals (Gaskets) for Joining Plastic Pipe) and shall be subject to such test as outlined under the ASTM Specifications.

3203.1.2 Gaskets for Concrete Pipe

All gaskets shall conform to CSA A257-3 (Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Section, and Fitting Using Rubber Gaskets) of ASTM C443 (Joints for Circular Concrete Sewer and Culvert Pipe (Using Rubber Gaskets)), and shall be subject to such test as outlined under the Specifications.

3203.2 MORTAR

Mortar, if specifically required and approved for pipe joints, shall consist of one part sulphate resistant cement Type HS (Type 50) in accordance with CSA A3001 or Type V in accordance with ASTM C150 to two parts of clear sharp sand.

3203.3 SEWER PIPE PLUGS

Manufactured plugs shall be supplied by the pipe manufacturer or shall conform to the following and shall be as watertight as possible:

.1 For 100 mm – 600 mm diameter pipe, an 18 mm plywood plug cut to fit the inside of the pipe's bell.

.2 For pipe diameter greater than 600 mm all plugs to be approved by the Engineer.

3203.4 CONCRETE DUCT JOINTS

Joints shall be sealed using Sikaflex products and joint systems or an alternate product approved by the County on a site specific basis.

Sikaflex products shall adhere to the following ASTM Specifications.

C 679	Standard Test Method for Tack-Free Time of Elastomeric Sealants
C 719	Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockamn Cycle)
D 412	Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers
D 624	Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers
D 2240	Standard Test Method for Rubber Property – Durometer Hardness

Sikaflex products and systems must be installed by an applicator approved by Sikaflex Canada. Contact and Sika Canada Technical Representative (Sean Coghlan) at 403-861-3456 (cell) of coghlan.sean@ca.sika.com, or 403-995-3540 (local office) or 1-800-933-7452 (National Office) for a list of approved applicators.

For joint widths 12 mm to 25 mm, use a Sikaflex 1a joint system. For joint widths 25 mm to 38 mm, use a Sikaflex 2c joint system.

For joint widths less than 12 mm or exceeding 38 mm, or for unusual or special conditions, contact manufacturer for recommendation on materials and practices. Note: these products are not intended to prevent moisture penetration through the joint due to outside hydrostatic pressure.

Minimum joint width shall be 12 mm and maximum joint width shall be 30 mm.

Prevent three-sided adhesion by using ethafoam rod (backing rod) at a 25% larger diameter than the joint width, or for shallow, wide joints use a bond breaker tape that covers the entire bottom of the joint.

Follow all installation procedures recommended by the manufacturer.

All joints shall be completely cleaned of all debris and moisture in accordance with the sealant manufacturer's recommendations prior to applying primer. Sealant shall not be installed is any moisture is evident on the application surface.

Apply primer to surfaces to receive sealant in accordance with the manufacture's recommendations.

To ensure optimal binding conditions, install joint sealant a minimum of 28 days after the date of fabrication stamped on the concrete duct and, in all cases, within 28 days of duct installation.

3203.5 FABRICATED AND INJECTION MOLDED FITTINGS AND COUPLINGS FOR PVC SEWER PIPE

All fittings shall have a CSA sticker and be approved under CSA B182.2 (PVC Sewer Pipe and Fittings PSM Type_ or CSA B182.4 (Profile OVC Sewer Pipe and Fittings). Materials used for molded fittings shall come from a single compound manufacturer and have a cell classification of 12364-C, 12454-B, 12454-C, or 13343-C as defined in ASTM D1784 (Rigid PVC Compounds and CPVC Compounds).

Locations proposed for Fabricated Fittings must be shown on the Construction Drawings and approved by the Engineer.

All couplings must be CSA approved and conform to ASTM C1173-06, D5926-04, and shall be subject to such tests as outlined under the ASTM specifications.

3203.6 CASING SPACERS FOR CARRIER AND ENCASEMENT PIPE

Skid height shall be such that there is a maximum space for 25 mm between the skid and casing pipe. If space is greater than 25 mm the void must be filled with sand or grout.

3203.6.1 Encasement Pipe

See **Encasement Pipe** for specification and sizing information.

3203.6.2 Carrier Pipe

See **Carrier Pipe** for information.

3204 SERVICES

3204.1 SERVICE LEADS

All pipe materials shall conform to the material specification set forward within **Sewer Pipe**.

The pipe diameter for service leads shall be limited to the sizes for the type of pipe shown in **Service Lead Pipes**.

For polyethylene pipe bursting requirements for service line replacements, refer to the pipe bursting procedures for replacing sanitary services detailed in **HDPE Pipe Bursting Procedures for Replacing Sanitary Services.**

3204.2 SERVICE LEAD JOINTING MATERIAL

All service lead joints shall be made watertight and root proof with jointing materials supplied by the manufacturer. All jointing materials shall be approved by the Engineer prior to use.

For approved materials see **Service Lead Jointing Material**.

3204.3 SERVICE LEAD BENDS, ADAPTORS, FITTINGS, AND CONNECTORS

All bends, adaptors and fittings shall be supplied by the service lead manufacturer and approved by the Engineer.

Bends consisting of a 22.5° deflection shall be used when required as per the Canadian Plumbing Code.

All service lead bends, adaptors, and fitting shall conform to the material specifications set forward within **Sewer Pipe Joints, Fittings, and Casing Spacers**.

All service connectors shall conform to the material specifications set forward within **PVC Pipe**.

3204.4 CONNECTOR SEALANTS

All sealants used for bonding service saddles to sewer mains shall be approved by the Engineer. For approved materials see **Approved Products: Connector sealants**.

3205 MANHOLES

3205.1 MANHOLES – GENERAL

All concrete used in the construction of manholes shall be manufactured from sulphate resistant cement Type HS (Type 50) in accordance with CSA A3001 or Type V in accordance with ASTM C150. All concrete structures shall be designed for CL-800 truck loading as per CSA-S6-00 (Canadian Highway Bridge Design Code_. All precast reinforced concrete manhole sections shall conform to ASTM C478.

Concrete compressive strength shall be 3 0 MPa (35 35 MPa for Box Conduit) at 28 days and air content shall be 4 to 7% except where no slump concrete is used. Concrete cover shall be a minimum of 25 mm.

All cast iron, cast steel, and ductile iron manhole components shall be un-coated except as specifically required by the engineer and approved by the County.

Standard Manhole Cover: Gray cast iron shall conform to ASTM A48 (Gray Iron castings) Class 20.

Grated Manhole Cover: Cast steel shall conform to ASTM A148 (High Strength Steel Castings for Structural purposes) Grade 90-60 or ductile iron shall conform to ASTM A536 (Ductile Iron Castings) Grade 60-40-18.

If specified and approved, the coating for cast components shall be asphalt varnish.

90 mm Shallow Manhole Frame and Manhole Frame Rise: Ductile iron shall conform to ASTM A536 (Ductile Iron Castings) Grade 60-40-18. Shallow manhole frames (90 mm and 150 mm) are not to be used in gravel lanes without prior approval from the County.

All precast reinforced concrete manhole barrels, bases, slab tops, adaptors, and risers shall conform to ASTM C478 (Precast Reinforce concrete Manhole Sections) and CSA 257.4 (Precast Reinforced Concrete Manhole Sections). All precast sanitary manhole bases shall be constructed with rubber gaskets or an approved equivalent sealant material.

Benching concrete compressive strength shall be 30 MPa at 28 days according to these Specifications.

Reinforcing steel shall conform to CSA G30.18M (Billet Steel Bars for Concrete Reinforcement) and shall be intermediate grade with yield strength of deformed bars equal to 400 MPa.

Welded wire reinforcement shall conform to ASTM A185 (Steel Welded Steel Reinforcement, Plain for Concrete) and shall have yield strength of 450 MPa.

For Type 5A Interior Drop Manhole, PVC pipe shall be DR 35 in accordance with CSA B182.2 (PVC Sewer Pipe and Fittings (PSM Type)).

Openings for connections into the manhole barrel shall, when possible, be pre-formed at the manufacturing plant. Pre-formed openings shall be provided with sleeves to accommodate a 'boot' connection or cast-in place gaskets (approved) for use with the intended pipe size and material. Limitations are the availability of gaskets for the intended size.

Openings for connection made in the field shall not be greater than the outer diameter of the pipe by more than 50 mm in any direction and shall be cored or cut. Remediation in excess of 50 mm shall be subject to approval by the County.

Acceptable Pipe Protrusion – large Diameter Round Manhole: Where the pipe enters a large diameter manhole (1500 and 1800 mm diameter), the pipe shall be flush with the inside manhole wall at the spring-line. Pipe protrusions at invert and obvert shall be mortared smoothly to avoid gaps and cracks, and to provide water tightness. It is recommended that the mortar be applied at approximately 45 to 75 degrees to the protruded pipe.

For large Diameter (1500 and 1800 mm) Round Manholes, only concrete pipe is permitted for connecting.

Acceptable pipe protrusion – 1S Manhole: Where the pipe enter the manhole the pipe shall be made flush with the inside of the manhole and the opening shall be mortared flush with the pipe and inside manhole wall.

For approved materials see **Manholes**.

3205.2 MANHOLE BARREL JOINTING MATERIAL

All gaskets shall conform to CSA A257.3 (joints for Circular Concrete Sewer and Culverts Pipe, Manhole Sections, and Fittings Using Rubber Gaskets) or ASTM C443 (Joints for Circular Concrete Sewer and Culvert Pipe (Using Rubber Gaskets)), and shall be subject to such test as outlined under the Specifications

Material supplied or recommended by the manufacturer and approved by the Engineer shall be sued in each barrel joint.

If pipe penetration occurs right at a joint between two manhole barrels, use mortar as described in **Mortar**. Mortar shall be placed on the exterior of the barrel joint.

3205.3 MANHOLE STEPS

Aluminum manholes steps shall conform to CSA CAN3-S157 (Strength Design in Aluminium).

Steel manhole steps shall conform to ASTM A36 (Carbon Structural Steel) and shall have a yield strength of 240 MPa. The steps shall be hot dipped galvanized according to ASTM A123 (Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products).

3205.4 MORTAR

Mortar used for sealing pipe penetrations shall consist of one part cement to two parts of clear sharp sand. Cement shall be sulphate resistant Portland Cement Type HS (Type 50) in accordance with CSA A3001 or Type V in accordance with ASTM C150.

3206 CATCH BASINS

3206.1 CATCH BASINS – GENERAL

Ductile iron shall conform to and be test as outlines in ASTM A536 (Ductile Iron Castings) Grade 60-40-18. Cast steel shall conform to and be tested as outlined is ASTM A148 (High Strength Steel Castings for Structural Purposes Grade 90-60.

For Type 'C' Catch Basin Frame gray cast iron shall conform to and be tested as outlined in ASTM A48 (Gray Iron Castings) Class 20. For Type 'K-2' Catch Basin Frame gray cast iron shall conform to and be tested as outlined in ASTM A48 (Gray Iron Castings) Class 40.

Bearing surfaces between cast frames and grates shall be attached to prevent rocking.

All castings shall be true in form and dimensions, free from faults, sponginess, cracks, blow holes, and other defects affecting their strength.

All cast iron, cast steel and ductile iron catch basin components shall be un-coated except as specifically required by the Engineer and approved by the County.

If specified and approved, the coating for cast components shall be asphalt varnish.

All catch basin slab tops, collars, barrels, and bases shall conform to ASTM C478 (Precast Reinforced Concrete Manholes Sections) and CSA A257.4 (Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings). All concrete used in the construction of catch basins shall be manufactured from sulphate-resistant cement Type HS (Type 50) in accordance with CSA A3001 or Type V in accordance with ASTM C150.

Concrete compressive strength shall be 30 MPa at 28 days and air content shall be 4 – 7% except where no slump concrete is used. Concrete cover shall be 30 mm minimum.

Reinforcing steel shall conform to CSA G30.18M (Billet Steel Bars for Concrete Reinforcement) and shall be intermediates grade with yield strength of deformed bars equal to 400 MPa.

All concrete structures shall be designed for CL-800 truck loading as per CSA-S6-00) Canadian Highway Bridge Design Code).

For approved material list see **Catch Basins**.

3206.2 SUMP CATCH BASINS

Sump catch basins shall be installed on a case-by-case basis where approved. A detailed drawing of the catch basin installation including the dimensions of the sump shall be included with the construction drawings submitted for approval.

3206.3 TESTS

All catch basin frames, grates, and side inlets shall be tested as outlines under their appropriate ASTM Specification.

3207 STANDARD DRAINAGE SWALE

All standard drainage swales shall be constructed according to the dimensions and material specifications on a case-by-case basis.

Concrete Finishing shall conform to the Specifications outline in **Concrete Finishes**.

3208 CAST IN PLACE CONCRETE

3208.1 CONCRETE FORM WORK

3208.1.1 Design by the Contractor

The Contractor shall design formwork and shoring to safely support all vertical and lateral loads, so that all concrete members will be of the correct dimension, shape, alignment, elevation, and position, and have the specified finish.

In general, formwork and soring shall be designed in accordance with the applicable requirements of CSA S269.1, CSA 269.3, ACI 347, CSA O86, and CAN/CSA S16.

All concrete structures shall be designed for CL-800truck loading as per CSA-S6-00 (Canadian Highway Bridge Design Code).

All applicable codes and regulations shall be complied with, respecting safety in the design and construction of formwork and shoring, where required by regulatory requirements, formwork and shoring shall be stamped by Professional Engineer registered with APEGGA.

3208.1.2 Materials

Forms shall be either wood or steel unless specified otherwise.

For all permanently exposed concrete surface (i.e. concrete surfaces that will not be covered by backfill or concrete), high-density overlaid plywood forms or steel panels made of clean, smooth material, free from holes, surface markings, and defect shall be used. Use similar forming material for each element to produce similar textures, color, and appearance.

False work materials shall conform to CSA S269.1, Table 1. Materials bearing grade marks or accompanied with certificates, test reports, or other proof of conformity shall be provided.

Removable or snap-off metal form ties shall be provided which are fixed or adjustable in length, free from devices leaving holes larger than 25 mm diameter in concrete and that break off no closer than 25 mm to the concrete surface.

Provide a release agent that will not stain the concrete. Release agents to be approved by the Engineer.

An approved sealer or form liner to prevent absorption of moisture from the concrete shall be used.

3208.2 CONCRETE REINFORCEMENT

Shop drawings shall be submitted for concrete reinforcement prior to fabrication.

Certified mill test reports shall be submitted for concrete reinforcement when requested by the Engineer.

Cold bend bars strictly to approved shop drawings. Bars shall be furnished in lengths indicated.

.1 Reinforcing Bars

Reinforcing bars shall be billet-steel deformed bars conforming to CSA G.30.18, Grade 400.

.2 Epoxy Coated Reinforcing Bars

Epoxy coated reinforcing bars shall conform to ASTM A775/A775M and CSA G30.18, Grade 400.

.3 Steel Wire Fabric

Steel welded wire reinforcement shall be in accordance with ASTM A185. Deformed steel welded wire reinforcement shall be in accordance with ASTM A497/A497M.

.4 Wire Ties

Plain, cold drawn, annealed steel sire conforming to CSA G30.3 shall be used.

.5 Accessories

Bar supports, bolster, chairs, and spacers shall conform to ACI 315 (Manual of Standard Practice for Detailing Reinforced Concrete Structure". Chairs made of non-ferrous metal or other approved non-staining material in slabs where the underside will be exposed to view shall be used.

3208.3 STRUCTURAL CONCRETE

3208.3.1 Structural Concrete - General

Concrete shall be furnished which shall develop a compressive strength no less than that shown on the construction plans. Forms shall be either wood or steel unless specified otherwise.

3208.3.2 Aggregate

All sources of aggregate used shall meet the requirements of these Specification. Lightweight aggregate shall meet the requirements of ASTM C33 for lightweight aggregate for structural concrete.

(i.) Fine Aggregate

Fine aggregate shall meet the requirements of ASTM C33 except as modified by the following paragraphs:

Fine aggregate shall be natural sand, washed clean, having hard, strong, sharp, durable, uncoated grains and shall be free from injurious amounts of dust, lumps, soft or flaky particles, mica, shale, alkali, organic matter, loam, or other deleterious substances.

Should the necessity for frequent rejection occur, no further sand will be accepted from the sources and another approved source will be required.

(ii.) Coarse Aggregate

Coarse aggregate shall conform to the requirements of ASTM C33 except as modified by the following paragraphs:

Coarse aggregate shall consist of gravel or broken stone composed of strong, hard, durable, uncoated pebbles, or rock fragments washed clean and free from injurious amounts of shale, coal, clay, lumps, soft fragments, dirt, glass and organic or other deleterious substances.

Aggregate sizing shall conform to ASTM C33 as indicated below. Aggregate shall be kept clean and free from all other materials during transportation and handling. The aggregates shall be kept separated from each other at the site, until measured and placed in the mixer.

Percent Passing by Weight			
Sieve Size (mm)	**Nominal 40 mm**	**Nominal 25 mm**	**Nominal 20 mm**
50	100		
40	95-100	100	
25		95-100	100
20	35-70		90-100
13		25-60	
10	10-30		20-55
No. 4	0-5	0-10	0-10
No. 8		0-5	0-5

3208.3.3 Cement, Water, and Additives

(i.) Portland Cement

Cement used on the work shall be Portland Cement. Bulk or bag cement may be used, but bulk cement shall be batched by an approved weighing device. The cement shall be sulphate resistant and meet the requirements of ASTM C150 (*Type V*) or CSA A3001 (*Type HS (50)*).

(ii.) Cement Content

A minimum amount of cement shall be used to produce the required strength of concrete as shown on the construction plans.

(iii.) Water Reducing Agent

Water reducing admixtures shall conform to Type 'A' ASTM C494.

(iv.) Water

Water used in mixing concrete shall be clean and shall not contain deleterious amounts of acids, alkalis, or organic material. All water shall be furnished form approved sources.

(v.) Air Entrainment Agent

Air entrainment agent material hall be added to all slump concrete mix for entraining from 4 – 7%, with an average of 5% of the air in the concrete by volume. Air entraining admixtures for concrete shall conform to ASTM C260.

3208.4 TESTING REQUIREMENTS

3208.4.1 Testing Requirements - General

The testing of random batched shall be done and test data shall be furnished to the Engineer. Reports shall include the following:

(i) Job to which concrete is being supplied
(ii) Date of sampling
(iii) Air temperature when sampling
(iv) Temperature of mix
(v) Name of supplier
(vi) Exact location on the structure in which the concrete is being placed
(vii) Specimen number
(viii) Slump (*determined in accordance with ASTM C143*)
(ix) Age of test
(x) Cylinder test
(xi) Method of curing
(xii) Air content(determined in accordance with ASTM C231)
(xiii) Type of cement
(xiv) Time batched an unloaded

When making test on fresh concrete, not less than three specimens for each test shall be molded for compressive tests to ASTM C192/C192M and ASTM C39. One cylinder shall be tested at seven days and two at 28 days.

The following shall be the minimum acceptable standard for the number of concrete tests required for the combination of storm and sanitary utilities:

Sewer Duct	One test for each 50 cubic meters of concrete, or fraction thereof, and in any event, not less than one test for each class of concrete used during each day.
Manholes	One test for every 10manholes poured in a batch (a batch can include both storm and sanitary) and, ins any event, not less than one test for the number of manholes between 1-10.
Bulk Concrete	One test for every 50 cubic meters on concrete used or one test for each inlet/outlet, junction, control and miscellaneous structure and every 10 manholes in a batch (including both storm and sanitary) and catch basins where bulk concrete is used for base slabs and/or benching, whichever is greater, but not less than one test per batch.
Concrete Drainage Swales	One test for every 300 lineal meters but not less than one test for a daily pour.

When the temperature is below 0°Cduring a pour or is likely to fall below 0°C within 24 hours after a pour is made, to additional specimens for each test shall be made. These two cylinders will be field cured on the job in a manner which simulates as closely as possible the curing of the volume of concrete sampled and tested at 28 days.

In the event that testing indicated substandard materials and workmanship, further testing shall be completed.

3208.4.2 Test Cylinders

Test cylinders shall be made and stored in accordance with ASTM C31 and will be tested in accordance with ASTM C39. In hot weather, correct storage temperatures may be maintained by ventilation from sand or burlap, and in cold weather by using heating devices.

When heating is impractical at the site it should be noted that cylinders are not to be transported any considerable distance immediately after molding.

It is preferable to transport the sample of concrete to the molding and curing site, so that the freshly molded specimens will be moved only a few feet by hand.

The cylinders should always be handled in a manner which provides the teste results with adequate protection against damage and ensures that the test results will provide a sound basis for evaluation of concrete quality.

3208.4.3 Strength Requirements

To conform to the strength requirements the average of all tests shall exceed the specified strength. When five or more tests of the same class of concrete are available, the average of any five consecutive tests shall be equal to, or greater than the specified strength. No three consecutive tests shall fall below the specified strength. Where those criteria are not met, the Engineer shall have the right to require one or more of the following:

(i) Changes in mix portions for the reminder of the work.

(ii) The additional curing on those portions of the structure represented by the test specimen which failed.

(iii) That cores be drilled from the portion of the structure in question and tested in accordance with CSA A23.2. The result of this test will help ascertain whether or not the specimens previously tested were truly representative of the concrete place.

If, after carrying out the requirements mentioned above, the Engineer is not satisfied that the concrete in the structure is of the specified quality, he/she may demand a strengthening or replacement of those portions which failed to develop the required strength.

3208.5 MIX DESIGN

All concrete shall be proportioned according to mix designs prepared by a Professional Engineer employed by an independent engineering material testing laboratory for the classes of concrete and nominal maximum size of coarse aggregate specified except where the concrete is to be supplied by a ready-mix plant. Where there Engineer so permits, mix designs mat be prepared by a Professional Engineer who is in the employ of the plant.

Concrete shall be designed to produce minimum cement content for each class of concrete shown on the construction plans. The concrete mix shall be so designed that the material will not segregate and excessive bleeding will not occur. A copy of the mix design shall be made available to the Engineer upon request.

3209 EMBEDMENT MATERIAL

3209.1 BEDDING MATERIAL

Bedding shall be of the type and class specified within the approved construction drawings, and if not specified in the construction drawings, shall conform to the details shown on **DRAWING 33: BEDDING AND BACKFILL DETAILS (*PIPE ZONE*)** and the following requirements:

- Bedding material shall consist of hard durable particles free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- Bedding material shall conform to the embankment materials specified in ASTM D2321.

The following tables must be used in conjunction with **DRAWING 33: BEDDING AND BACKFILL DETAILS *(PIPE ZONE*).** The bedding materials listed are divided into Class 1A, 1B, II and III consisting with ASTM D2321 *(Flexible Pipe Installation Specification*) and ASCE Standard Practice for Concrete Pipe Design (*SIDD*) 15.

Minus 20 mm bedding material is specified for pipe sizes 375 mm and smaller for improved support underneath the haunches of the pipe.

Class 1A – Manufactured Aggregate; Open Graded, Clean

For Pipe 375 mm and Smaller	
Sieve Size	**Percent Passing by Mass**
20 mm	100%
4.75 mm	10%
2.5 mm (#8)	5%
0.075 mm (#200)	5%

For Pipe Larger than 375 mm	
Sieve Size	**Percent Passing by Mass**
40 mm	100%
4.75 mm (#4)	10%
2.5 mm (#8)	5%
0.075 mm (#200)	5%

Class 1B – Manufactured Processed Aggregate; dense graded, clean

For Pipe 375 mm and Smaller	
Sieve Size	**Percent Passing by Mass**
20 mm	100%
4.75 mm	10% - 50%
2.5 mm (#8)	5%
0.075 mm (#200)	5%

For Pipe Larger than 375 mm	
Sieve Size	**Percent Passing by Mass**
40 mm	100%
4.75 mm (#4)	10% - 50%
2.5 mm (#8)	5%
0.075 mm (#200)	5%

Class II – Coarse-Grained Soils; clean or borderline clean to with fines

For Pipe 375 mm and Smaller	
Sieve Size	**Percent Passing by Mass**
20 mm	100%
4.75 mm (#4)	Varies
0.075 mm (#200)	0% - 12%

For Pipe Larger than 375 mm	
Sieve Size	**Percent Passing by Mass**
40 mm	100%
4.75 mm (#4)	Varies
2.5 mm (#8)	0% - 12%

Class III – Coarse Grained soils with fines

For Pipe 375 mm and Smaller	
Sieve Size	**Percent Passing by Mass**
20 mm	100%
4.75 mm (#4)	Varies
0.075 mm (#200)	0% - 12%

For Pipe Larger than 375 mm	
Sieve Size	**Percent Passing by Mass**
40 mm	100%
4.75 mm (#4)	Varies
0.075 mm (#200)	12% - 50%

3209.2 CONCRETE ENCASEMENT

Concrete shall be minimum 13.6 MPa strength and shall be manufactured from sulphate resistant cement Type HS (*Type 50*) in accordance with CSA A3001 or Type V in accordance with ASTM C150. No air entertainment is required for encasement concrete with more than 2.0 m of earth cover. Where groundwater flow is anticipated, material or products shall be used to mitigate the migration of fines into bedding material.

3209.3 WARNING TAPE

Warning tape is to be a minimum of 150 mm wide, 0.125 mm thick, with a detectable metal foil layer and shall be fabricated with materials that are suitable for underground service (*polyester/polyethylene*). Sanitary and storm warning tape graphics are to include wording equivalent to "CAUTION SEWER LINE BURINED BELOW" on a green background as per the APWA colour codes.

32010 FOUNDATION STABILIZATION MATERIAL

Stabilization foundation gravel shall consist of hard durable particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.

The materials shall be a Class 1A material as described above and in ASTM Specification D2321 with a maximum aggregate size of 40 mm. Subject to Water Resources approval, pit run gravel may be used on a project instead of Class 1A material, provided a written request from a specialist Geotechnical Engineer is received certifying the pit run material and there are less than 12% fines by mass passing the 0.075 mm *(#200*) sieve size.

Stabilizing foundation synthetic filter fabric shall consist of durable, permeable, non-woven, polyester fabric composed of continuous synthetic filaments in a random arrangement with a minimum properties as follows:

Fabric Weight	213 g/m^2
Thickness	2.0 mm
Tensile Grab Strength	710 N
Tear Strength	310 N
Mullen Burst Strength	2,000 kPa

4000 WATERWORKS

4100 SCOPE

These Specifications form part of the Contract Documents for the installation of: distribution main, feeder main, and water and sewer service connections. Distribution mains are generally defined as main 400 mm in diameter and smaller and feeder mains are generally defined as mains larger than 400 mm in diameter.

All work performed on existing and new water systems shall be carried out in accordance with the latest issue of the Wheatland County Design and Construction Standards and the Manufacturer's Specifications. In case of any inconsistency or conflict between these documents the provision of documents shall govern in the following order:

1. Wheatland County Design and Construction Standards
2. The Manufacturer's Specifications

Unless otherwise specified, the Contractor shall furnish all material, equipment, tools and labour necessary to do the work.

In these Specifications, the term "Engineer" shall denote the Wheatland County Representative, or his authorized representative. All deviations from these Specifications and the approved Construction Drawings shall have the written approval of the Engineer.

4200 INSPECTION

4201 GENERAL

The Engineer shall have free and uninterrupted access to work areas for the purpose of carrying out inspections. The Contractor shall provide, at no cost to the County, such labour and access as may be required to enable the Engineer to carry out a complete inspection of all installation and materials. The Contractor shall provide adequate samples of materials for testing purposes.

The Engineer has the authority to stop work and order the re-excavation and removal of any or all installations if any material or installation method employed does not conform to these Specifications.

All material found during the progress of the work with cracks, flaws or other defects shall be rejected by the Engineer. All rejected materials shall be promptly removed from the work site by the Contractor.

The Contractor shall give 48 hour's notice to the Inspection Section of his intention to commence construction all new installations and prior to commencing of the following repair work:

- Repair of mains and service connections.
- Repair of cathodic protection systems.
- Repair of valves, hydrants and pressure-reducing valves.
- Construction or maintenance work for other utilities which require the exposure of a watermain.

It is the Contractor's responsibility to ensure that all work is inspected by the Professional Engineer prior to back-filling. The Final Acceptance Certificate will not be issued if inspection of new construction and/or maintenance work was not requested.

4201.1 INSPECTION OF SITE PRIOR TO CONSTRUCTION

Prior to construction, the Contractor shall carry out an inspection of the work sites to identify any damage or deficiencies that might exist on, or adjacent to the work area. The Contractor shall notify the Engineer in writing of all such deficiencies or damage prior to construction. Any deficiencies or damage not identified by the Contractor prior to construction shall be corrected or repaired by the Contractor at no expense to the County.

4201.2 INSPECTION OF SACRIFICIAL ANODES AND TEST POINTS

All installations of sacrificial anodes, test points and related wiring shall be inspected by the Engineer prior to back-filling. It shall be the Contractor's responsibility to notify the Engineer and request inspection of each cathodic protection installation. Where back-filling over anodes and test wires has been carried out prior to inspection, the Contractor shall, when requested by the Engineer, re-excavate and expose all anodes and test wires, at no cost to the County, for the purpose of inspection.

4201.3 DAILY PROGRESS REPORT

These "daily progress reports' will be used for the preparation of progress payments on County administered contractors. Progress reports shall be made out in quadruplicate by the on-site Inspector of each day's work.

These reports will include all work done by the Contractor each day as broken down in the schedule of quantities and in addition, will provide a detailed list of all equipment, materials and labour supplied on force account including the force account rates. The Contractor shall also provide a copy of all utility location slips as part of the daily report.

An authorized representative of the Contractor shall sign each "daily progress report" within 24 hours after the completion of each day of work, acknowledging that he has carefully examined the quantities of the work performed as indicated on the "daily progress report" for that day and agrees as to its accuracy. Should any dispute result with respect to the quantity of any work performed on that day, it shall be brought immediately to the Engineer's attention by the Contractor.

If the dispute is not resolved immediately, the Contractor shall place on file with the Engineer a written report clearly stating his position and quantities of work for which he feels should be paid. Failure to file such written notice within 28 hours of advising the Engineer shall result in the use of the quantities indicated on the disputed "daily progress report" in the preparation of progress payments without further recourse by the Contractor even if he has not signed the "daily progress report".

Should an error in quantities be discovered on any "daily progress report" after it is signed, it may be corrected providing both parties mutually agree to the change. If the quantities can be readily measured, the re-measured quantity shall be used for payment.

The Contractor shall give advance notice to the inspector of his intention to perform force account work. The amount of force account work and force account rates shall be mutually agreed to by both parties prior to performing the work.

The Contractor will be provided with two (*2*) copies of each signed "daily progress report" for his file.

The purpose of the "Daily Progress Report" is:

1. To avoid disputes over the quantities of work done when making out progress payments.
2. The mutually agree on the quantities of work performed prior to completion of the work so that measurements can be more readily retaken if a dispute results.
3. The avoid inadvertently leaving out work performed by the Contractor when preparing the progress payments.
4. The set up a procedure for the Contractor to follow if a dispute results to that it can be resolved at the earliest time.
5. To aid the Engineer and the Contractor is evaluating the progress of the construction.

4202 MATERIALS

4202.1 LIST OF APPROVED MATERIALS

The following is a list of approved materials. For detailed specifications of all materials refer to Standard Drawings. The materials listed below have received approval by the County based on meeting various Specifications (*e.g. AWWA, CSA, ASTM, UL, FM, NSF, etc*.). Subsequent design changes by a Manufacturer to approved items on this list may result in the County withdrawing an approval. Changes to the design or specifications of approved materials require approval of the Engineer.

.1 Distribution Pipe

Ductile Iron Pipe (*Yellow Jacket Coates*), sizes 100 – 400 mm
Canada Pipe Company Ltd. or approved equal
Polyvinyl Chloride Pipe (*PVC*), sizes 100 – 400 mm
IPEX, Royal, NEXT or approved equal

.2 Hydrants

Clow Brigadier – McAvity
Mueller Modern & Super Centurion
Terminal City C71-P
AVK Model 2700 & Model 2780 or approved equal

.3 Distribution Valves

(i) Line Valves

Resilient seated Gate Valves, sizes 150 – 400 mm
Mueller, Clow, AVK, East Jordan or approved equal

(ii) Flange to Hub Valves (for tapping)

Resilient Seated Gate Valves, sizes 150 – 300 mm
Mueller, Clow, AVK or approved equal

(iii) Master Control Valves

OS&Y Gate Valves, sizes 100 – 300 mm
AVK, Matco, Toyo, Watts, Mueller, T.C., Clow, Kennedy or approved equal
Important Note: Dual use Master Control valves for Combination Fire and Domestic service lines shall be UL, ULC, & FM listed.

.4 Pressure Reducing Valves, sizes 75 – 300 mm

(i) Clayton:

Model 90-01DSY (*sizes 75 mm and smaller*)*
Model 90-01BSY (*sizes 100 mm and larger*)*

(ii) Singer

Model 106 – PR-C (*sizes 100 mm* ***and larger***)*

4202.2 MATERIAL SPECIFICATIONS

4202.2.1 Material Approval Procedure

The County requires that the prior written approval of the Engineer be received for all products to be incorporated in the distribution system. The Engineer reserves the right to withdraw the approval of any product if in his opinion the product does not perform satisfactorily.

Manufacturers whose products conform to these Specifications are encouraged to submit to the County a written request for product approval together with detailed product Specifications and sufficient samples to conduct field evaluations, preference will be given to products manufactured in an ISO 9000 certified production facility. The product evaluation process may exceed a period of one year. Only a complete product line will be considered.

4202.2.2 Surface Quality of Castings

All casting for fittings, valve bodies, hydrants barrels, valve bottom and top boxes, valve lids and any other castings which are to be incorporated in the distribution system shall be free from injurious defects. Surfaces of castings shall be free of burned-in sand and shall be reasonably smooth. Sharp edges shall be rounded to a minimum radius of 3 mm. Runners, risers, fins and other useless cast-on pieces shall be removed by the Manufacturer prior to the delivery of the casting to the coating applicator. All castings shall have the Manufacturer's name (identification marks) distinctly cast upon them and such other information as requested throughout these Specifications. The County Engineer may reject any casting at the Manufacturer's yard or at the coating applicator's yard, which in his opinion does not conform to these requirements.

4202.2.3 Ductile Iron Pipe

Ductile iron pipe shall conform to the AWWA C151-02 Standard, and shall be cement mortar lined in accordance with AWWA C104-03. Where seal coat is applied to the mortar lining, the coating shall be NSF61 listed. Ductile iron pipe shall be minimum Pressure Class 350. Unless otherwise specified the pipe shall be supplied with bell & spigot ends complete with continuous, molded rubber-ring NBR (Nitrile) gaskets and conforming to the AWWA C111-00 Standard. Ductile iron pipe shall be supplied with copper conductivity strips "Conductoflex" welded to the bell and spigot c/w jumper strip, nuts and bolts.

Where conductivity strips are not supplied with the pipe, continuity across joints may be provided in the field with a #6 TW cable thermite welded to the bell & spigot. Ductile iron pipe shall be eternally coated as specified in Sec. 4606.

The pipe Manufacturer, Distributor and Installer shall ensure that the bell and spigot end of each pipe length remain sealed in a manner acceptance to the Engineer to prevent contaminants from entering the interior of the pipe from the time of manufacture to the time of installation.

The minimum class and wall thickness for coated ductile iron pipe for use under cathodic protection shall be as follows:

Size of Pipe (mm)	Pressure Class	Wall Thickness mm (“)	Class 53 for Threading*
100	350	6.4 (.25”)	8.1 (.32”)
150	350	6.4 (.25”)	8.6 (.34”)
200	350	6.4 (.25”)	9.1 (.36”)
250	350	6.6 (.26”)	9.6 (.38”)
300	350	7.1 (.28”)	10.1 (.40”)
400	350	8.6 (3.4”)	10.9 (.43”)

* Ductile iron pipe for use with rehab-on flanges or in grooving applications shall be Special Class 53, as specified in AWWA C115 / A21.15-99

4202.2.4 PVC Pipe

Polyvinyl chloride (*PVC*) pipe shall be CI. O.D. will bell and spigot ends. All pipes shall be supplied with integral wall thickened bell ends and continuous gaskets. Gaskets shall be SBR, EDPM, or NBR of a pressure actuated seal design (*optional for 400 mm pipes*). PVC pipe for installation in industrial areas, new gas station sites or other potential risk locations as designated by the Engineer shall be supplied with Nitrile (*NBR*) gaskets.

PVC pipe shall not be installed in areas known to be contaminated by organic solvents or petroleum products, i.e. near existing buried petroleum fuel tanks, storage areas, refinery sites or abandoned gas stations.

PVC pipe shall conform to the following:

Pipe Size	Dimension Ratio / Class (DR) / (Class)	Conform / Certified
100 mm	14 / 200	AWWA C9800-97 CSA CAN 313 137.3
150 – 300 mm	18 / 150	AWWA C900-97 CSA CAN 313 137.3
400 – 500 mm	18 / 150	AWWA C905-97 CSA CAN 313 137.3

PVC pipe showing evidence of sever UV degradation with a production date of more than eighteen (*18*) months previous shall be considered unacceptable. Manufacturers may request re-certification of pipe based on submittal of QC re-testing acceptable to the Engineer.

The use of 100 mm PVC pipe is restricted to residential cul-de-sacs. A minimum pipe size 150 mm or larger, as required, shall be installed to the appro0ved location on a cul-de-sac, c/w a 150 mm valve. Beyond this point the pipe may be reduced to 100 mm. The Engineer shall approve all usage of 100 mm pipe.

PVC pipe shall be certified under the CSA or by an SCC accredited testing organization. The interior of the pipe shall be clean and no debris or PVC shavings shall be trapped inside the pipe. The pipe Manufacturer, Distribution and Installer shall ensure that the bell and spigot end of each pipe length remain sealed in a manner acceptable to the Engineer during the transportation and

storage of the pipe. The purpose of the end-seals is to prevent contaminants from entering the interior of the pipe from the time of manufacture to the time of installation.

Pipe-ends shall be sealed with suitable, plastic caps, or with black (*UV stable*), 6 mil (*0.15 mm*) thickness, linear low-density polyethylene bag. Bags shall be placed over the ends of the pipe section and firmly taped down (*6 wraps min*.) with 25 mm wide, 12 mil (0.3 mm) thick, black, Polyken 900 (*or approved equal*) tape. Bags shall have the following dimensions:

Nominal Pipe Size (mm)	Polyethylene Bag Size	
	Width (mm)	Depth (mm)
100	260	330
150	360	380
200	460	510
250	560	580
300	660	640
400	860	760

4202.2.5 Polyethylene (HDPE) Pipe

Polyethylene pipe and fittings shall conform to the AWWA C906-99 Standard and shall be PE 3408 with a dimension ratio (*DR*) 11 and working pressure rating (*WPR*) 160 psi, unless otherwise approved. HDPE pipe for potable water use must be identified by blue longitudinal printing, striping or a blue outer-shell. The outside diameter (*OD*) shall conform to ductile iron (*DIPS*) or iron pipe size (*IPS*) as approved by the Engineer. The use of HDPE in potable water systems is limited to special applications, such as trenchless, carrier or transmission pipe installation. HDPE project design shall conform to the design principles outlined by AWWA M55 Design Manual.

Drawings shall show details of the fusing method of each joint, thrust restraint details, the location of standard or special fittings and complete connection/closure details at proposed tie-ins. These drawings shall be submitted and approved by the Engineer prior to construction.

HDPE pipe for these applications shall be Driscoplex by CP Chemical Performance Pipe, KWH Sclairpipe, and PolyPipe by CS Rinker, WL Plastics, Flint Global Poly, or an approved equal. Electro-fusion fittings and processors shall be Friatec, Central Plastics, Plasson, Tega, Elofit, or an approved equal. The design and installation of HDPE must be in compliance with the manufacturer's guidelines. HDPE fusion joints shall be made by factory trained or industry certified personnel using appropriate equipment, procedures and fittings.

Operator certifications for each fusing method employed on a project shall be presented for inspection and shall have a date no more than one calendar year previous to be considered valid. All butt and electro-fusion shall be performed in the presence of the Engineer unless otherwise approved. Microprocessor fusing logs shall be submitted to the Engineer for every butt fuse made and for each electro-fuse fitting where used. Butt fusing shall not commence on site until the Fusing Operator has successfully completed a "Bent Strap" test (*as per the Plastics Pipe Institute Handbook*) to the satisfaction of the Engineer.

The pipe Manufacturer, Distributor and Installer shall ensure that the bell and spigot end of each pipe length remain sealed in a manner acceptance to the Engineer during the transportation and storage of the pipe. HDPE pipe shall not be installed in areas contaminated or potentially contaminated with volatile organic compounds (organic solvents or petroleum products).

4202.2.6 Steel Pipe

Steel pipe for bypass or alteration piping shall conform to ASTM Specification A53, standard wall, with an approved end preparation of field welding. Fittings shall be standard weight seamless or welded with beveled ends for butt welding. Flanges shall be 150 lb. forged ASA type. Steel pipe shall be coated and lined to the following Specifications:

Lining: Cement mortar conforming to AWWA C205-00 Type A internal coating or a NSF61 listed 100% solids epoxy as approved by the Engineer.

Coating: Yellow Jacket No. 1 extruded polyethylene, Type "A" coating system a NSF61 listed 100% solids epoxy, P.E. tape or other coating system as approved by the Engineer.

The pipe Manufacturer, Distributor and Installer shall ensure that the bell and spigot end of each pipe length remain sealed in a manner acceptable to the Engineer during the transportation and storage of the pipe.

4202.2.7 Hydrants

Hydrants shall be ULC (*Underwriter Laboratories of Canada*), UL (*Underwriter Laboratories, US*) or FM (Factory Mutual Fire Insurance Company) approved and shall also conform to the AWWA C502-94 Standard. Hydrants shall be dry-barrel compression type supplied with an inlet elbow bell-end sized for 150 mm cast iron pipe O.D. Hydrants shall be supplied with a frangible (break-away) connection at the grade line flanges. Unless otherwise specified, hydrants shall be supplied with continuous, molded rubber-ring gaskets confirming to the AWWA C11-00 Standard.

NBR (*Nitrile*) gaskets shall be supplied for hydrants which will be installed in areas contaminated or potentially contaminated with volatile organic solvents or petroleum products, i.e. near buried petroleum fueled tanks, abandoned gas stations, petro storage areas or petro refinery sites.

Hydrants shall be of the "Dry-Top" design with a totally enclosed chamber for the operating mechanism, sealed with O-rings. Packing glands and stuffing box designs are not acceptable. The operating housing shall be grease lubricated.

Outlet nozzles shall be fastened into the barrel by a threaded or approved bayonet connection. The drain valve shall close as the compression valve starts to open. The interface between the removable parts of the main valve assembly and the hydrant body shall be bronze to bronze. The operating nut shall be 32 mm² (*1 ¼ in²*) and shall turn counter-clockwise (*left*) to open.

All hydrants shall have two (*2*) hose connections 57 mm (*2 ½"*) in size at 180 degrees with Alberta Mutual Thread and 114 mm (*4 ½"*) pumper connection to the following thread detail:

- 4 threads per 25.4 mm
- 154 mm O.D.
- Root 145 mm with 0.51 mm flat top and bottom

The hose connection outlets shall be supplied with cast iron caps, factory lubricated for ease of removal. The caps shall not be secured to the hydrant body with chains or cables.

Hydrants shall be supplied with a single 150 – 600 mm barrel and stem extension located immediately below the grade-line flange except where approved by the Engineer and shall have a minimum of one stem guide (spider) if the cross-sectional area of the operating stem is less than 1000 mm ² (*1.5 in²*). The dimension from the grade line flange to the center-line of the lowest outlet nozzle shall be a minimum of 400 mm.

The exterior of the hydrant above and 300 mm below the grade line flange shall be coated in accordance with Section 4605 (*Type C*) in the following colours:

- Bright Green Body: C.I.L. #3486, Valspar 20-G-684, Cloverdale Hydrant Yellow base #11104, ICI 634-2017, or approved equal.
- Hydrants on non-potable and reclaimed water systems shall be painted purpose (*Pantone 522 C*) with black caps.
- Black Caps and Top: Cloverdale #11107, or approved equal.

The exterior of the remaining buried hydrant barrel shall be coated in accordance with Section 4604 (*Type B*).

The Coating Applicator shall ensure that all threads, including those on outlet nozzles, are protected from the sandblasting and coating procedures. After the coating application the Coating Applicator shall remove all sand from threads and restore the lubricants on all nozzles and cap threads. Electrical continuity shall be maintained between all exterior parts of the hydrant.

The depth of bury shall be defined as a distance from the invert of the suction elbow to 500 mm below the underside of the grade line flange.

4202.2.8 Distribution Valves

(i) General

All distribution valves shall be resilient seat unless otherwise approved. Valves shall be equipped with a 50 mm square operating nut and shall turn clockwise (*right*) to open unless otherwise specified. Working pressure shall be 1380 kPa (*200 psi*) for valves 300 mm and smaller, and 1030 kPa (*150 psi*) for valve 400 mm and larger. The stem seal shall be of an O-ring or other pressure actuated seal design.

All resilient seated line and tapping valves shall be ULC, UL or FM approved and shall also conform to the AWWA C509-01 or AWWA C515-09 Standard. Valves shall be either cast or ductile iron body, resilient rubber seated disc style with non-rising stem. The interior (*ferrous parts*) of the valve shall be factory coated with epoxy coating to conform to AWWA C550-01.

All valves shall be supplied with a circular bottom box guide plate. Metallic type guide plates shall be coated in accordance with Section 4603 (*Type A*). The guide plate shall be located below the operating nut and shall be designed to center the operating nut inside the designated bottom box. Unless otherwise specified, valves shall be supplied with continuous, molded rubber-ring gaskets conforming to the AWWA C111-00 Standard. The exterior of all buried distribution valves shall be factory coated in accordance with Section 4604 (*Type B*) or as approved by the Engineer.

NBR (*Nitrile*) gaskets shall be supplied for valves which will be installed in areas contaminated or potentially contaminated with volatile organic compounds (*organic solvents or petroleum products*), i.e. near buried petroleum fuel tanks, abandoned gas stations, petro storage areas or petro refinery sites.

(ii) Line Valves

Unless otherwise approved by the Engineer, line valve ends shall be bell type suitable for push on single rubber gasket joints. The gaskets shall be supplied with the valve and the cost of the gaskets shall be included in the cost of the valve. Line valves shall be approved resilient seated gate valves, conforming to the AWWA C509-01 Standard and these Specifications. Valves shall be epoxy coated externally in accordance to AWWA Standard C550-01 and coated internally with an approved NSF 61 listed epoxy coating.

(iii) Flanged and Tapping Valves

Unless otherwise approved by the Engineer, flanged and tapping valves shall be supplied with a flat face flange (*without a spigot alignment rings*) conforming in dimensions and drillings to ANSI B16.1 class 125 or AWWA C110-03 Standards, and where specified, a bell type end suitable for push on single rubber gasket joints. Bell-end gaskets shall be supplied with the valve and the cost of the gaskets shall be included in the cost of the valve. Non isolating flange gaskets shall be an EDPM or Nitrile, NSF61 listed rubber compound, full-faced, multiple integral o-ring style, 3.18 mm thick. Isolating flange kits, where required, shall be as listed on in section 4202.2.26.

4202.2.9 Distribution Valve Operating Assembly

For 100 to 400 mm valves, the valve rod, top box, valve box adapters, valve lids, casing and bottom box shall conform to the standard drawings.

4202.2.10 Pressure Reducing Valves

Pressure reducing valves shall maintain a constant downstream pressure regardless of varying inlet pressure. Pressure reducing valves shall be cast or ductile iron body with flat face flanges conforming in dimensions and drillings to ANSI B16.1 and class 125 or AWWA C110-03 Standards equipped with a hydraulically operated, diaphragm-actuated, globe valve assembly. They shall include stainless steel trim seats, an external position indicator, and 6 mm pet-cocks on the inlet and outlet side of the valve. A separate pet-cock shall be supplied on the inlet and outlet side of the valve to accommodate pressure gauges. The pilot control system shall have an external strainer and direct acting, adjustable, spring loaded, normally open diaphragm valve with an all stainless steel or brass body, c/w stainless steel or brass bolts. Pressure reducing valves with optional flow monitoring capability shall be preferred.

4202.2.11 Check Valves

All check valves shall conform to the AWWA C508-01 Standard. They shall be iron-body bronzed mounted swing check valves. Disc hanger pins shall be stainless steel, and voer nuts and bolts shall be stainless steel or zinc plated. Check valves located between two pressure zones shall be supplied with an outside lever and weight. Check valves on private sites shall not be equipped with lever and weight.

4202.2.12 Fittings

(i) Cast and Ductile Iron Fittings

Cast and ductile iron full body fittings for use in chambers or direct bury (*i.e. tees, crosses, bends and reducers*) sizes 100 mm to 400 mm shall have bell-ends conforming to the AWWA C110-03 Standard. Flanges, where approved, shall conform in dimensions and drillings to ANSI B16-1 class 125 or AWWA C110-03 Standards.

Compact ductile iron fittings conforming to AWWA C-153-00 shall be permitted for direct bury use only. Flanges, where approved, shall conform in dimensions and drillings to ANSI B16-1 class 125 or AWWA C110-03 Standards. Non isolating flange gaskets shall be an EDPM or Nitrile, NSF61 listed rubber compound, full-faced, multiple integral o-ring style, 3.18 mm thick.

The exterior and interior of all fittings shall be fusion bond epoxy coated in the factory of by an approved third party coating facility in accordance with AWWA C-16-03 and Section 4603 (*Type A*) of these Specifications.

Unless otherwise specified, all fittings shall be supplied with continuous, molded rubber-ring gaskets conforming to the AWWA C111-00 Standards.

NBR (*Nitrile*) gaskets shall be used where fittings are to be installed in areas contaminated or potentially contaminated with volatile organic compounds (*organic solvents or petroleum products*), i.e. near buried petroleum fuel tanks, abandoned gas stations, petro storage areas or petro refinery sites.

(ii) Polyvinyl Chloride (PVC) Fittings

PVC injection-molded fittings, i.e. tees, elbows, tapped couplings (*AWWA thread*), sizes 100 – 300 mm, line and repair couplings, reducers and plugs, sizes 100 – 300 mm shall be Class 150 conforming to UNI-BELL B-12-87 Standard and AWWA C907-91 Standards.

Tees, elbows, tapped (*AWWA thread*) couplings and reducers sizes 100 – 200 mm shall also conform to CSA CAN/CSA – B137.2-M 93. Fittings shall be supplied with continuous (*jointless*) elastomeric gaskets. All gaskets for PVC fittings shall be of a pressure actuated seal design.

PVC extruded fittings, i.e. long body 5° elbows, sizes 100 – 400 mm shall be Class 150, DR 18, conforming to AWWA C900-97. PVC fittings shall not be installed in areas contaminated or potentially contaminated with volatile organic compounds (*organic solvents or petroleum products*), i.e. near buried petroleum fuel tanks, abandoned gas stations, petro storage areas and petro refinery sites.

4202.2.13 Tapping Sleeves

(i) General

Tapping sleeves shall be either a mild steel split body type, or a stainless steel full wrap gasket style with integral flat face flanges (*without spigot alignment groove*), conforming in dimensions and drillings to ANSI B16.1 class 125, or AWWA C110-03 Standards. They must be available for all nominal pipe sizes between 100 mm and 400 mm and shall accommodate PVC, Cast Iron, Rough Barrel Asbestos Cement Class 150, and Standard Steel pipe.

They shall have a 20 mm (*3/4"*) NPT test plug for pressure testing; have permanent identification marking identifying the Manufacturer's name, nominal size & O.D. range and shall be packaged as a complete unit (*i.e. sleeves, gaskets, nuts and bolts*). The tapping sleeve Manufacturer shall supply complete installation information including bolt torques.

The tapping sleeve installer shall follow the installation and bolt torque procedure as outlined in the product installation guide and shall demonstrate the proper bolt installation torque with a torque wrench at the Engineer's request.

NBR (*Nitrile*) gaskets shall be supplied for tapping sleeves which will be installed in areas contaminated or potentially contaminated with volatile organic solvents or petroleum products, i.e. near buried petroleum fuel tanks, abandoned gas stations, petro storage areas or petro refinery sites.

(ii) Stainless Steel Tapping Sleeves

All metallic parts of the stainless steel tapping sleeve shall be fabricated from 18 – 8 Stainless Steel, Type 304 or Type 304L. All surfaces including weld areas shall be thoroughly cleaned of scale, grease (*oil*) and other contaminants. Sensitized stainless steel is not acceptable. Bolts shall be 16 mm (*5/8")* SS with hex-nuts, NC rolled threads, lubricated (*coated*) to prevent falling. These sleeves are approved for use on all pipe materials for all taps up to 400 mm including "size on size" taps *(branch size same as main*). For "size on size" taps on Asbestos Concrete, Cast Iron, or PVC pipe, a 12.5 mm undersized cutter must be used. For "size on size" taps on 400 mm PVC pipe, a 350 mm cutter shall be used.

(iii) Mild Steel Tapping Sleeves

The mild steel tapping sleeve shall be supplied with 20 mm (*3/4"*) mild steel or stainless steel bolts, NC heavy-hex nuts. The tapping sleeve, including nuts & bolts (*stainless accepted*) shall be coated in accordance with Section 4603 (*Type A*). Coated flange faces shall be supplied with EDPM or Nitrile, NSF61 listed rubber compound, full-faced, multiple integral o-ring style gaskets, 3.18 mm thick. These sleeves are approved for use on metallic main for taps up to 400 mm, excluding "size on size" taps on Cast Iron. These sleeves may be used on PVC main up to 300 mm in diameter provided that the outlet size is a full pipe size less than the main (*i.e. 250 mm*).

Size on size tapping with this type of sleeve on PVC main is not permitted. Tapping of AC pipe with this type of sleeve is not permitted.

4202.2.14 Couplings

(i) General

Product Specifications:

The Manufacturer shall supply complete cataloging of couplings including product Specifications and selection charts. The selection chart shall provide detailed information on the selection of end-plates, gaskets and boots relative to various pipe OD's

Coating:

The body sleeve, end plates and bolts, (*except flange faces and stainless steel nuts & bolts*) shall be factory coating in accordance with Section. 4603 (*Type A*). or as approved by the Engineer. Electrical conductivity must be provided between all metallic parts of the coupling. Electrical conductivity between bolts and end plates shall be provided by removing the coating from the bolt nut, bolt head and end-plate bearing area. Alternate electrical conductivity designs must be approved by the Engineer. Refer to Section 4607 for field coating requirements.

Couplings shall be available for all nominal pipe sizes, i.e. 100 mm to 400 mm inclusive to accommodate: Cast Iron; Rough Barrel Asbestos Cement Class 150 and Standard Steel Pipe. End-plates shall be designed to provide the best possible back up support for the gaskets.

(ii) Flange Coupling Adapters

Material:

The body and end plates shall be made of ductile iron conforming to ASTM A536. Bolts shall be 304 stainless steel with; hex-nuts, NC rolled threads, lubricated (coated) to prevent galling. Bolt diameter shall be 16 mm (*5/8"*) for 100 mm (*4"*) couplings, 20 mm (*3/4")* for 150 & 200 mm (*6" & 8"*) couplings and 22 mm (*7/8"*) for 250 & 300 mm (*10" & 12"*) couplings unless otherwise approved by the Engineer. Coated flange faces shall be supplied with EDPM or Nitrile, NSF61 listed rubber compound, full-faced, multiple integral o-ring style gaskets, 3.18 mm thick.

4202.2.15 Electrical Isolating Elements

Unless otherwise approved, electrical isolation in a metallic distribution system shall be achieved by one of the following:

- A short length (*600 mm*) of PVC pipe placed in line, coupled with bell & spigot joints or straight line couplings.
- An approved isolating flange kit placed between two flanges.
- A straight line isolating coupling placed between two plain pipe-ends.

4202.2.16 Sacrificial Anodes

(i) General

Anode lead wires shall be a minimum of 4 m in length and shall consist of AWG#10/7 stranded copper wire with type RWU-90insulation. Magnesium anodes shall be supplied with a blue lead wire. Zinc anodes shall be supplied with a white lead wire. The lead wire shall be connected to the core with silver solder or an approved equal.

The connection shall be insulated by filling the recess and any voids in the lead wire core connection with an electrical potting compound. Packaged anodes shall be supplied in a water permeable cardboard tube containing a back-fill mixture with the following composition:

Ground Gypsum – CaSO4●2H2O	75%
Powdered Bentonite – Al4Si8O20(OH)4NH2O	20%
Anhydrous Sodium Sulfate – NA2SO4	5%

(ii) Zinc Anodes

Zinc anodes shall conform to ASTM. B418 Type II (latest edition). Anodes shall have a minimum open circuit potential of -1.10 volts referenced to Cu/CuSO4. Zinc anodes shall have the following composition:

Aluminum	0.005%	maximum
Cadmium	0.003%	maximum
Iron	0.0014%	maximum
Lead	0.003%	maximum
Copper	0.002%	maximum
Zinc	Remainder	

4202.2.17 Test Points

Flush mount test points, where permitted, shall be as detailed by the Engineer.

4202.2.18 Water Service Pipe

All new water services shall be sized to meet the current minimum water service size requirements of The Canadian Plumbing Code Division B. Water service pipe shall be one of the following:

(i) Copper Pipe: sizes 20 – 50 mm

Copper pipe shall be Type K, soft copper conforming to ANSI/AWWA C800-01 Standard and ASTM B88. All copper pipe shall be third party certified (TPC).

(ii) PEX Pipe (*Cross-linked Polyethylene Pipe*): sizes 20 – 50 mm

PEX pipe shall be manufactured in accordance with CSA B137.5 and ASTM F876 and shall comply with NSF 14 & 61 (*PW*). The degree of cross-linking for PEX pipe shall be not less than 70% when tested according to ASTM D2765, Method B. PEX pipe shall meet CSA / NSF approved pressure rating:

- 160 psi @ 23°C / 73.4°F
- 100 psi @ 82°C / 180°F
- 80 psi @ 93°C / 200°F

The outside diameter of the pipe shall be copper tube size (*CTS*) and must have a standard dimension ratio (*SDR*) of 9. PEX pipe shall be manufactured in natural colour of in sky Blue (*RAL 5015*) and shall carry the following marks every five (*5*) feet (*minimum*): manufactures' name, nominal size, ASTM, CSA & NSF designations, SDR (*standard dimension ratio*), pressure / temperature rating, potable tubing, manufacturing date & machine number and footage mark. The pipe shall have consecutive footage marks every five (*5*) feet (*minimum*) starting with zero (*0*) at the beginning of each coil. The pipe shall be shipped in protective cardboard boxes marked with the product name and size.

4202.2.19 Water Service Saddles

(i) Materials:

Service saddles shall be constructed of stainless steel, bronze or a combination of both. Stainless steel components shall be Type 304 or 304L. All surfaces including weld areas shall be thoroughly cleaned of scale, grease (*oi*l) or other contaminants. Welding must be performed to prevent sensitization. Sensitized stainless steel is not acceptable.

Bronze saddle components shall be Waterworks Bronze (*85-5-5-5*) and conform to the ASTM standard B62 or A40B. Service saddles shall be available for nominal pipe sizes 100 m to 400 mm and adaptable to the following pipe types and respective OD ranges:

- Non-Isolating Saddles shall be suitable for PVC with CI OD and Rough Barrel Asbestos Cement Class 150 Pipe.
- Isolating Saddles shall be suitable for steel, cast iron and ductile iron pipe.

Service saddles shall be a stainless one piece or a two component (*body and strap*) design with fastening devices on each side of the outlet. The body shall be heavy cast stainless steel or cast bronze tapped with AWWA taper (*CC*) threads; stainless steel straps with 13 mm stainless steel bolts & nuts with NC rolled threads lubricated to prevent galling.

Gaskets shall be adequately secured to metal components to resist shifting. Non-isolating gaskets shall be neoprene for water services. Isolating gaskets shall be SBR isolating compound of high dielectric strength and low water absorption and shall prevent the metallic saddle components from contacting the pipe. NBR (*Nitrile*) gaskets shall be supplied for saddles to be installed in areas contaminated or potentially contaminated with organic solvents or petroleum products, i.e. near buried petroleum fuel tanks, abandoned gas stations, petro storage areas or petro refinery sites.

The opening in the gaskets shall be the same as the nominal diameter of the saddle outlet. Gaskets shall extend 6 mm minimum beyond the saddle components edge. Service saddles shall conform to the following table:

Nominal Pipe (mm)	Nominal Outlet (mm)	Strap Type	
		Non Isolating	Isolating
100, 150	20	D, SW	SW
100, 150	25	D, SW	SW
100	40, 50	D, SW	SW
150	40, 50	D, SW	SW
200	20, 25, 40, 50	D, SW	SW
250, 300, 400	20, 25, 40, 50	D, SW	SW

(ii) Where:

S	Single strap minimum width 45 mm with two (*2*) fastening devices, one on each side of the outlet.
D	Double strap, (*two single straps*) minimum width of 45 mm each, complete with four (*4*) fastening devices, two (*2*) on each side of the outlet.
SW	Single wide strap, minimum width of 100 mm c/w four (*4*) fastening devices, two (*2*) on each side of the outlet for two component bronze and stainless saddles. All stainless one-piece saddles shall use a minimum of two fasteners on pipe up to 200 mm and a minimum of four fasteners for 250 mm and above pipe.

(iii) Markings:

The following permanent identification markings shall be provided:

- Manufacturer's Name
- OD Range
- Type (*Isolating or Non-Isolating*).

4202.2.20 Main Stops

Main stops shall be of brass construction (*brass or stainless steel ball type*) listed under the NSF 61 Standard, and conforming to AWWA C800-01 Standards with AWWA (*Mueller*) threads on the inlet and compression type connection on the outlet end.

The compression ends shall be designed with a "limited travel" compression nut to prevent over-stressing (*necking down*) the service pipe. Main stops shall be isolating where directly tapped to metallic pipe and non-isolating type where connecting to a non-metallic pipe or isolating service saddle.

4202.2.21 Service Valves

Service valves 50 mm and smaller shall be of brass construction listed under the NSF 61 Standard, and conforming to AWWA C800-01 Standards. Unless otherwise specified by the Engineer service valves shall be the non-draining type.

The service valve shall be a "full port" ball design supplied with a suitably coated brass or stainless steel ball with compression type ends. The operator shall have a minimum thickness of 9.6 mm with a hole diameter of 7 mm centered 8 mm from the base.

The compression ends shall be designed with a "limited travel" compression nut to prevent over-stressing (necking down) of the service pipe.

4202.2.22 Service Valve Operating Assembly

The operating rod shall be supplied as a single unit. The Manufacturer's name shall be embossed onto the clevis. The cotter pin shall be slightly bent to prevent it from falling out during transport. For 20 mm & 25 mm service valves the Type A operating rod shall be used and for 40 mm & 50 mm service valves the Type B operating rod shall be used.

4202.2.23 Sewer Service Pipe

All pipe materials shall conform to the material specifications.

4202.2.24 Sewer Service Pipe Jointing Material

All pipe-jointing materials shall conform to the material specifications.

4202.2.25 Sewer Service Pipe Elbows, Adapters and Fittings

All elbows, adapters and fittings shall be supplied by the service Pipe Manufacturer and approved by the Engineer. Bends consisting of 22.5° deflection shall be used when required as per the Canadian Plumbing Code.

4202.2.26 Sewer Service Saddles

All sewer service saddles shall conform to the material specifications.

4202.2.27 Isolating Flange Kit

Isolating flange kits shall be designed to fit flat face flanges conforming in dimensions and drillings to ANSI B16.1 class 125 or AWWA C110-03 Standards. Gaskets shall be Type 'E', G-10, 3 mm thick, epoxy glass, c/w NBR O-rings or seal rings imbedded on opposite sides of the gasket, or full faced NBR or neoprene sealing surfaces. Where supplied, the O-ring placement shall be compatible with the flanges used. The kit shall include sleeves of G-10 epoxy glass material c/w two G10 washers and two zine plated steel washers per sleeve, sized to permit clear passage of the bolt sleeves through the washer bore.

4202.2.28 Joint Restraints

Concrete thrust blocks shall be provided for all tees, bends, plugs reducers and hydrants as detailed on the Standard Drawings and where specified throughout these Specifications. When approved by the Engineer, approved joint restraints may be used in addition to thrust blocks in high traffic areas where time is of the essence and back-filling has to be carried out immediately in order to restore traffic. Under no circumstances shall the joint restrainer be used as an alternate to thrust blocks. Each joint restraint bolt shall be protected by an approved zinc anode cap meeting ASTM B418. Anode caps shall be 6 oz. for up to and including on inch bolts and shall be 14 oz. for bolts above one inch in diameter. All non-coated threads and bolting surfaces on

joint restraints, excepting anode caps, shall be wrapped with an approved petrolatum paste and tape as listed in section 4607 of the Specifications.

4202.2.29 Handling and Storing of Materials

(i) General

Pipe, fittings, valves, hydrants and accessories shall be loaded, unloaded and lowered into the trench using adequate lifting and rigging equipment satisfactory to the Engineer. Under no circumstances shall such material be dropped, piled or rolled in such a way as to cause excessive impact. The handling and moving of all materials shall be kept to a minimum. Damaged coating or lining shall be repaired to the satisfaction of the Engineer at no cost to the City. Yellow-jacketed pipe and Polyvinyl Chloride (*PVC*) pipe shall not be stored in a manner that exposes the pipe to direct sunlight for a period in excess of twelve (*12*) month.

PEX pipe shall be shipped and stored in protective cardboard boxes. PEX shall not be stored in such a manner as to cause exposure to direct sunlight for periods in excess of three (*3*) months. If it is necessary to store the pipe in excess of this period, the Contractor shall at no cost to the County, provide a suitable cover (*canvas or other opaque material*) to protect the pipe from the sun. A minimum of 75 mm of air space shall be provided between the pipe surface and the cover to prevent heat buildup.

(ii) Ductile Iron and Steel Pipe

Coated ductile iron and steel pipe shall be handled and placed using wide slings and padded cradles of canvas, leather or other suitable material to prevent damage to pipe and coating. The use of bare metal cables, chains, hooks or other equipment that may cause damage to coating will not be permitted. Coated pipe shall be supported on sandbags or suitable wooden blocks. When it is necessary to walk on coated pipe, soft-soled shoes shall be used.

(iii) Concrete Pipe

This clause pertains to high-pressure concrete cylinder pipe manufactured in accordance with AWWA C301-99 and AWWA C303-02 Standards as supplied by Hyprescon, Ameron or others.

Concrete pipe may not be placed directly on the ground. Suitable support such as sand bags, tires or timber shall be used. Timber blocking may be required when the pipe is placed on soft or sloping ground and in locations where local activity or vandalism could be a problem.

Stacking of concrete pipe will not be permitted. Interior pipe bracing shall not be removed until after the pipe has bene placed in the trench and back-filled.

Joint gaskets which form part of the pipe shipment shall be stored flat in an area which is clean and dry, free from dirt, oil, grease, solvents and not exposed to sunlight.

WHEATLAND COUNTY

STANDARD DRAWINGS

OCTOBER 2016

WHEATLAND COUNTY

Where There's Room to Grow


WHEATLAND COUNTY
Where There's Room to Grow

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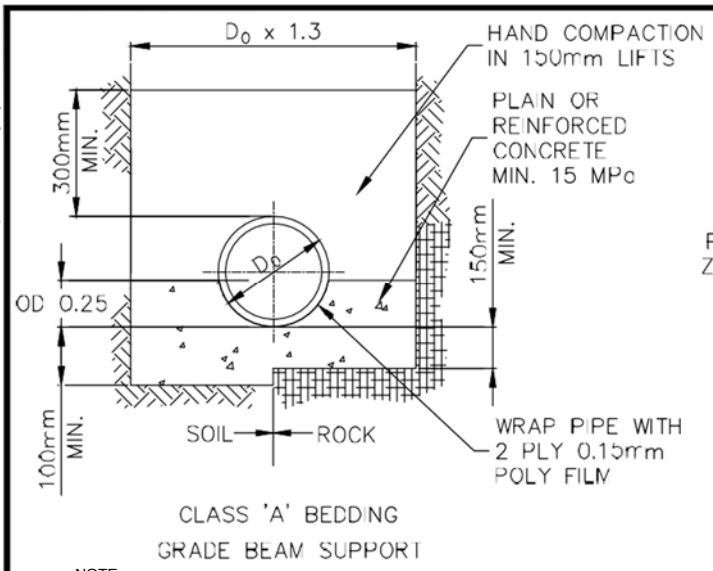
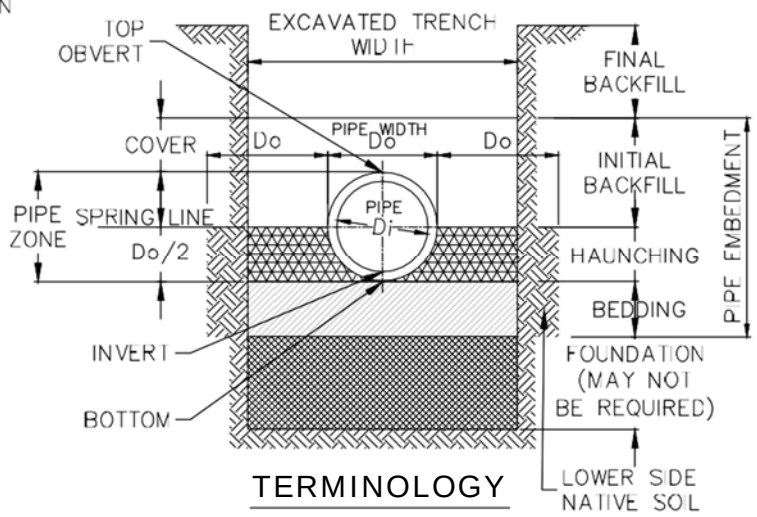
E-107	Separate Sidewalk Details	06/16
E-108	Crossing for Separate Sidewalk	06/16
E-109	Standard Monolithic Commercial Sidewalk	06/16
E-110	Standard Wheelchair Ramp for Separate Sidewalk with Sidewalk Widening	06/16
E-111	Standard Wheelchair Ramp for Separate Sidewalk	06/16
E-112	Standard Wheelchair Ramp for Monolithic Sidewalk	06/16
E-113	Concrete Swale	06/16
E-114	Asphalt Walkway & Bicycle Pathway	06/16
ROADWORK		
H-101	Gravelled Lanes 6.10m to 10 m Right-Of-Way	06/16
FENCING AND LANDSCAPING		
L-101	Barbed Wire Fence Details	06/16
L-102	Standard Chain Link Fence	06/16

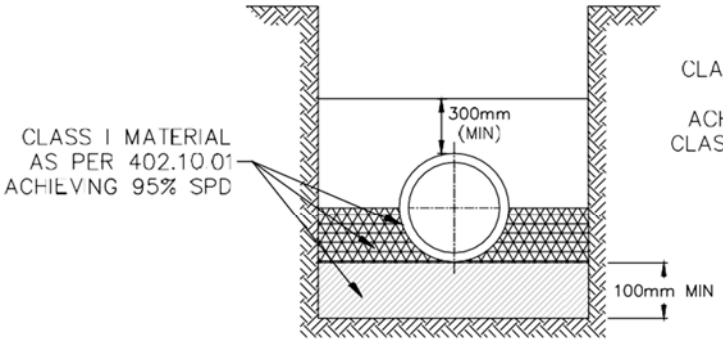


CLASS 'A' BEDDING
GRADE BEAM SUPPORT



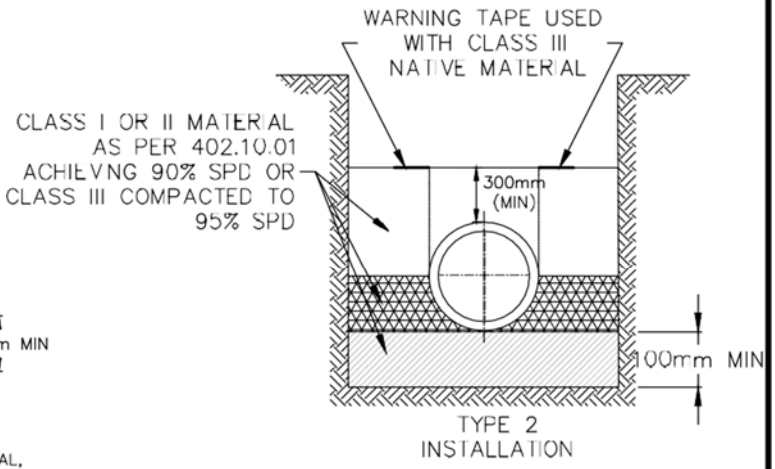
TERMINOLOGY

NOTE:
CONCRETE STRUCTURE AND SUPPORT TIE IN DESIGN SHALL BE APPROVED BY A PROFESSIONAL ENGINEER.

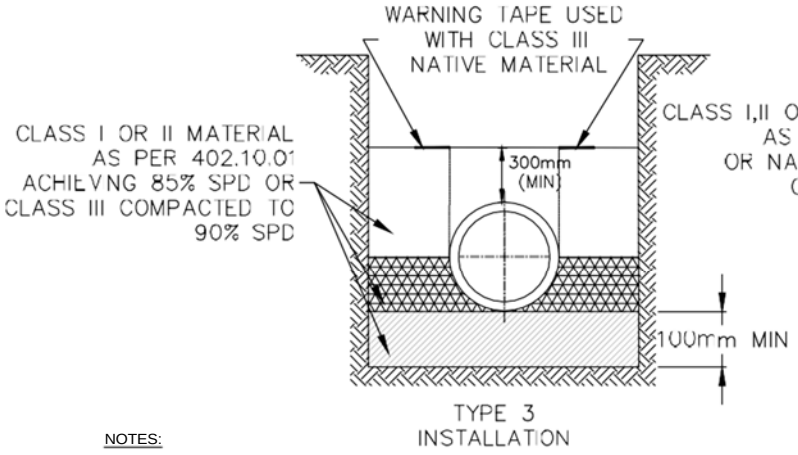


TYPE 1
INSTALLATION

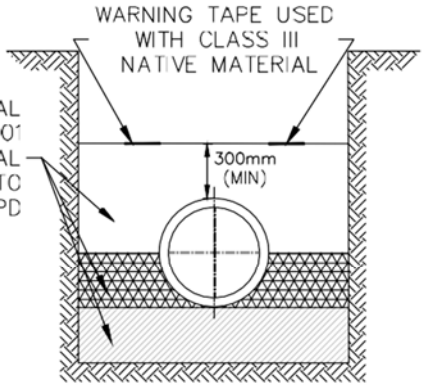
TYPE 1 INSTALLATION REQUIRES THAT THE MATERIAL, DENSITY AND METHOD OF INSTALLATION BE CERTIFIED BY PROFESSIONAL ENGINEER.
PRIOR APPROVAL IS REQUIRED FROM WATER RESOURCES MANAGER OF INFRASTRUCTURE PLANNING, CITY OF CALGARY



TYPE 2
INSTALLATION



TYPE 3
INSTALLATION



TYPE 4
INSTALLATION

TYPE 4 INSTALLATION ONLY APPROVED FOR USE WITH RIGID (CONCRETE) PIPE

NOTES:

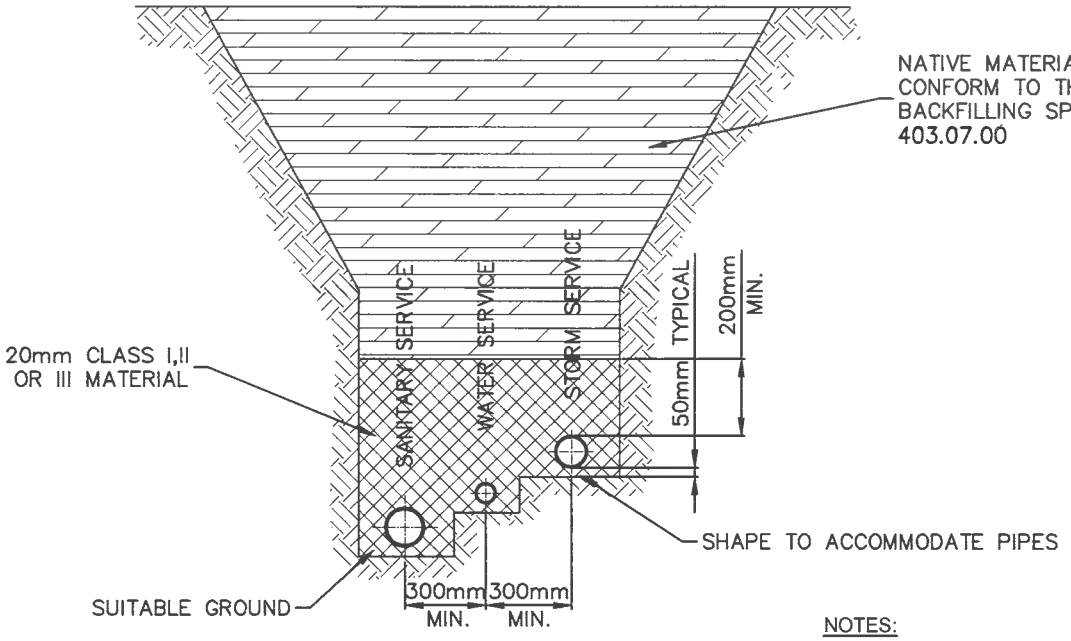
1. BEDDING UNDER THE MIDDLE THIRD OF THE PIPE SHALL BE LOOSE, UNCOMPACTED MATERIAL.
2. IF A ROCK FOUNDATION, THEN MINIMUM BEDDING THICKNESS IS Do/12 (NOT LESS THAN 150mm).
3. IF Do IS GREATER THAN 2400mm, THEN MINIMUM BEDDING THICKNESS IS Do/24.
4. FOR INITIAL BACKFILL MATERIAL OPTIONS IN A RIGID (CONCRETE) PIPE INSTALLATION, SEE SECTION 403.04.04
5. SEE ALSO SECTION 403.04.00 FOUNDATION AND EMBEDMENT INSTALLATION.
6. ADVISE ENGINEER IF LOWER SIDE NATIVE SOILS ARE SOFTER OR LOOSER THAN PIPE EMBEDMENT SOILS AS PER SECTION 403.04.05 (CHANGE IN NATIVE SOIL CONDITIONS).

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD

CLASS A BEDDING DETAIL

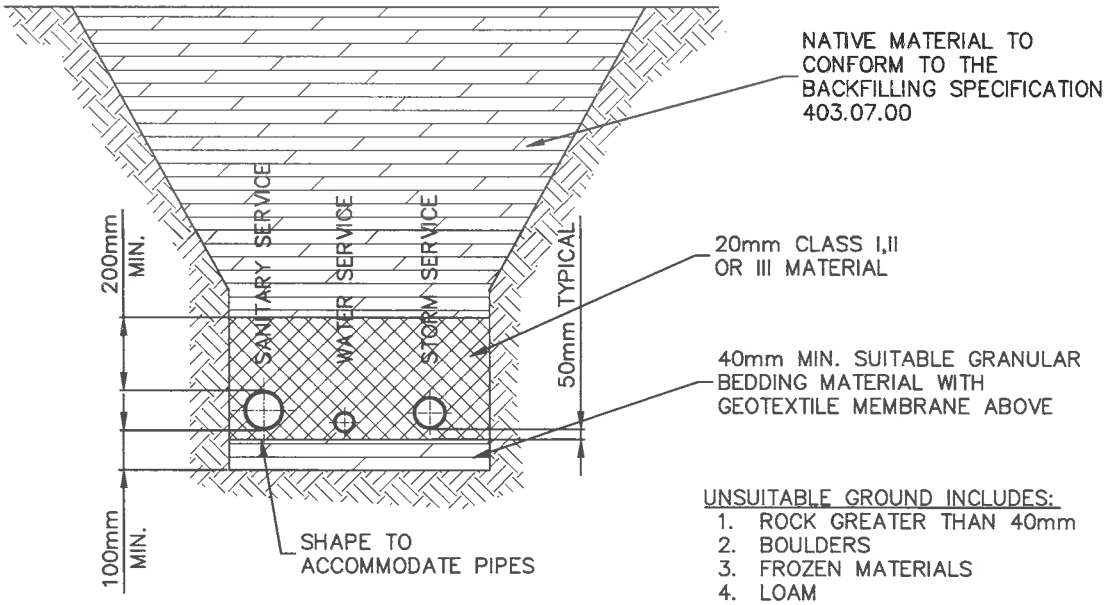
ISSUE DATE: JUN, 2016
SCALE: N.T.S.
DRAWING: A-101



SERVICES AT DIFFERENT ELEVATIONS IN SUITABLE GROUND

NOTES:

1. BACKFILLING & COMPACTION SHALL BE DONE IN SEQUENCE FROM THE LOWEST UTILITY TO THE HIGHEST IN INCREMENTAL LIFTS OF 150mm



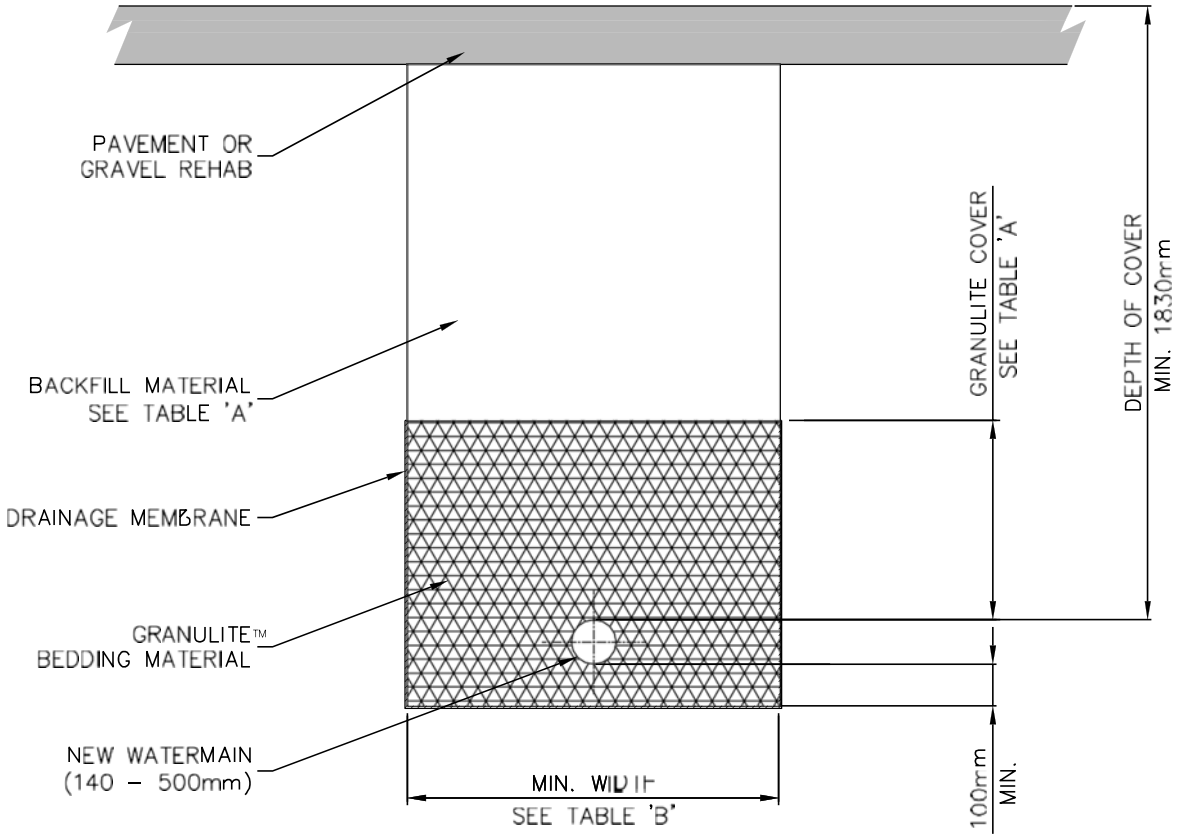
UNSUITABLE GROUND INCLUDES:

1. ROCK GREATER THAN 40mm
2. BOULDERS
3. FROZEN MATERIALS
4. LOAM
5. SATURATED MATERIAL

SERVICES IN UNSUITABLE GROUND

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STANDARD TRENCHING AND BACKFILLING FOR HOUSE LEADS	SCALE: N.T.S.
	DRAWING: A-102



NOTES:

1. GRANULITE IS AN INSULATIVE BEDDING MATERIAL

TABLE 'A'

TYPE OF BACKFILL	GRANULITE COVER
CLAY (mm)	930
GRANULAR (mm)	1030

TABLE 'B'

PIPE SIZE (mm)	150–300	400
MIN. TRENCH WIDTH (mm)	1220	1320

WHEATLAND COUNTY
Where There's Room to Grow

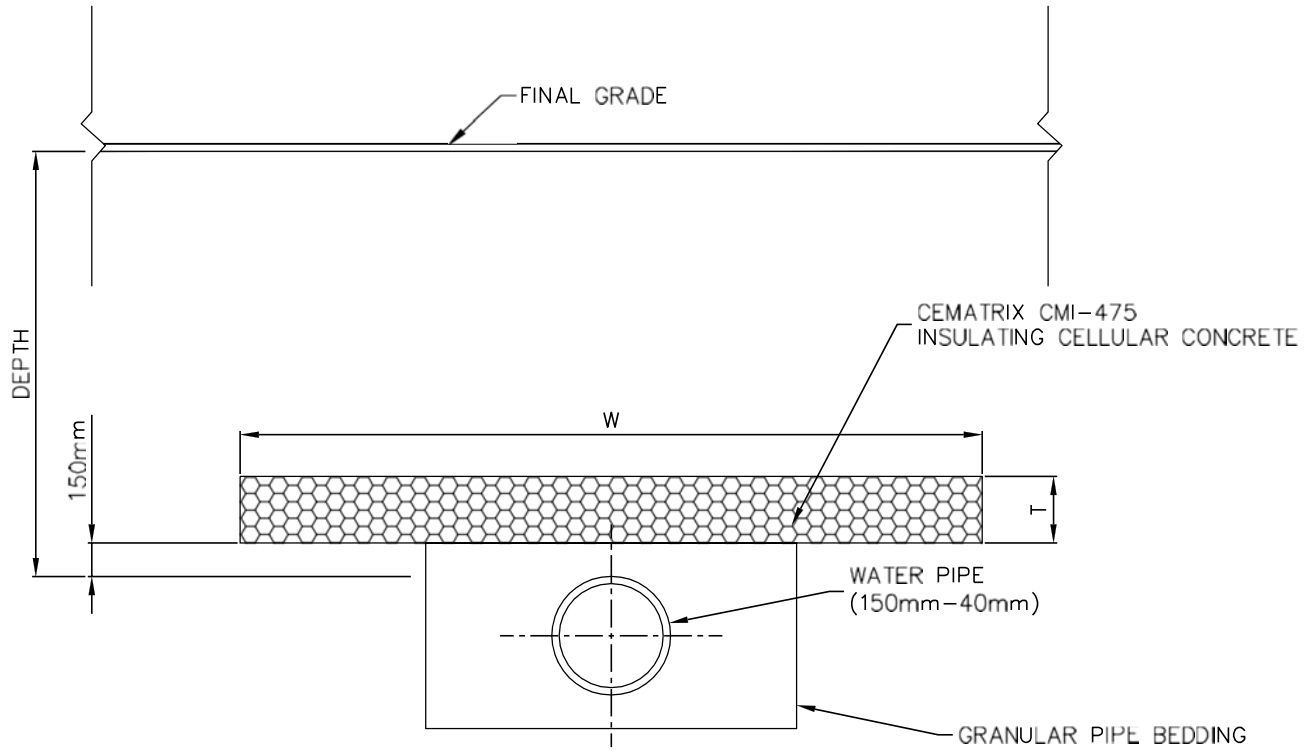
MUNICIPAL STANDARD

SHALLOW DEPTH
WATERMAIN REPLACEMENT

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: A-103



DEPTH	CLAYS	
	LOOPED MAIN/SERVICES	
	W (m)	T (mm)
1.6–1.8	2.6	225
1.8–2.0	2.4	
2.0–2.2	1.8	175
2.2–2.4	1.4	
2.4–2.7	1.2	125

DEPTH	CLAYS		GRAVELS		MIXTURE CLAY & GRAVEL	
	DEAD END MAINS/SERVICES, HYDRANT LEADS		ALL INSTALLATIONS		ALL INSTALLATIONS	
	W (m)	T (mm)	W (m)	T (mm)	W (m)	T (mm)
1.6–1.8	3.4		4.0		3.4	225
1.8–2.0	3.0	225	3.6	275	3.0	200
2.0–2.2	2.4	175	3.2	225	2.4	175
2.2–2.4	2.0		2.8	200	2.0	
2.4–2.6	1.6	150	2.3	175	1.6	150
2.6–2.8	1.4	100	1.8	150	1.4	100
2.8–3.0	1.2	100	1.4		1.2	100
3.0–3.3	---	---	1.2	125	---	---

NOTES:

1. DENSITY OF CEMATRIX CMI-475 INSULATING CELLULAR CONCRETE = 475 KG/cu.m
2. CEMATRIX SHOULD BE CONTACTED FOR SITE SPECIFIC DESIGNS WHERE SPACE IS LIMITED OR WHERE PIPES HAVE LESS THAN 1.6 m SOIL COVER.
3. APPROVAL REQUIRED AS PER SEC. 504.04.15 WATERWORKS SPECIFICATIONS

WHEATLAND COUNTY
Where There's Room to Grow

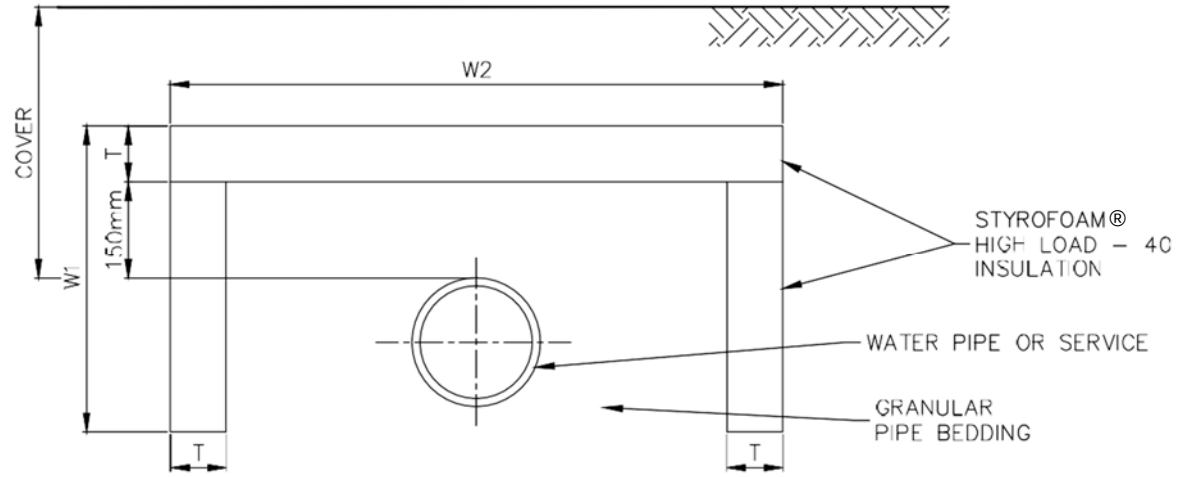
MUNICIPAL STANDARD

CELLULAR CONCRETE INSULATION - HORIZONTAL

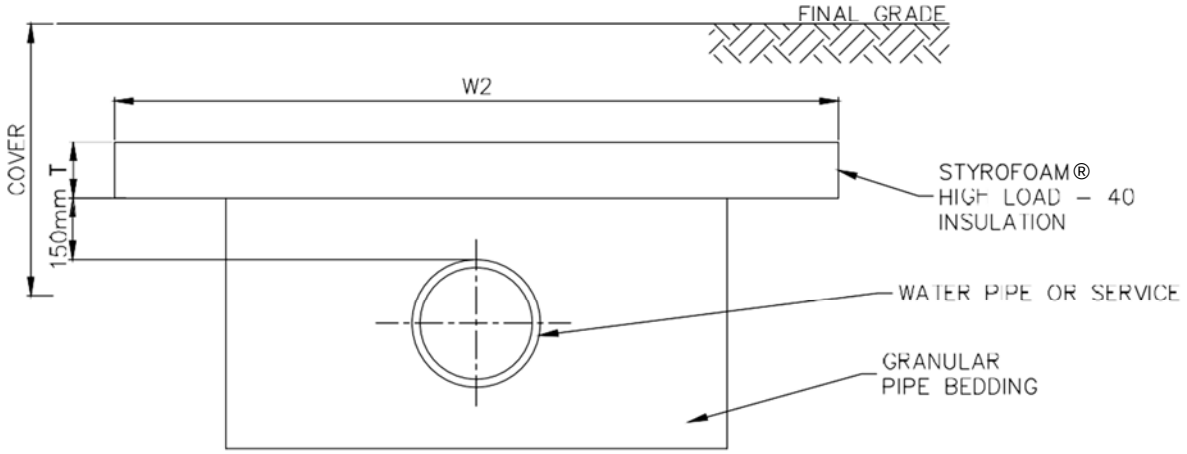
ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: A-104



PIPE COVER (m)	MINIMUM INSULATION THICKNESS T (mm)	MINIMUM INSULATION WIDTH. W=2W1+W2 (m)									MINIMUM INSULATION THICKNESS T (mm)	MINIMUM INSULATION WIDTH W (m)		
		PIPE DIAMETER 150–200 mm			PIPE DIAMETER 250–300 mm			PIPE DIAMETER 400 mm				SERVICES, HYDRANT LEADS, DEAD END MAINS		
		CLAY	MIX	GRAVEL	CLAY	MIX	GRAVEL	CLAY	MIX	GRAVEL		CLAY	MIX	GRAVEL
1.6–1.8	75	2.4	3.0	3.6	2.5	3.1	3.7	2.6	3.2	3.8	100	3.2	3.5	3.8
1.8–1.9	50	2.0	2.6	3.2	2.1	2.7	3.3	2.4	2.8	3.4	100	2.8	3.1	3.4
2.0–2.1	50	1.8	2.2	2.8	2.1	2.3	2.9	2.4	2.4	3.0	100	2.4	2.7	3.0
2.2–2.3	50	1.8	1.8	2.4	2.1	2.1	2.5	2.4	2.4	2.6	75	2.0	2.3	2.6
2.4–2.5	50	0.8	1.8	2.0	0.9	2.1	2.1	1.0	2.4	2.4	75	1.6	1.9	2.2
2.6–2.7	50	0.4	1.8	1.8	0.5	1.1	2.1	0.6	1.2	2.4	75	1.2	1.5	1.8
2.8–2.9	50	–	0.6	1.8	–	0.7	2.1	–	0.8	2.4	50	0.8	1.1	1.4
3.0–3.1	50	–	–	0.8	–	–	0.9	–	–	1.0	50	–	0.7	1.0
3.2–3.3	50	–	–	0.4	–	–	0.5	–	–	0.6	50	–	–	0.6



PIPE COVER (m)	MINIMUM INSULATION THICKNESS T (mm)	MINIMUM INSULATION WIDTH. W=2W1+W2 (m)									MINIMUM INSULATION THICKNESS T (mm)	MINIMUM INSULATION WIDTH W (m)		
		PIPE DIAMETER 150–200 mm			PIPE DIAMETER 250–300 mm			PIPE DIAMETER 400 mm				SERVICES, HYDRANT LEADS, DEAD END MAINS		
		CLAY	MIX	GRAVEL	CLAY	MIX	GRAVEL	CLAY	MIX	GRAVEL		CLAY	MIX	GRAVEL
1.6–1.8	75	2.4	3.0	3.6	2.5	3.1	3.7	2.6	3.2	3.8	100	3.2	3.5	3.8
1.8–1.9	50	2.0	2.6	3.2	2.1	2.7	3.3	2.2	2.8	3.4	100	2.8	3.1	3.4
2.0–2.1	50	1.6	2.2	2.8	1.7	2.3	2.9	1.8	2.4	3.0	100	2.4	2.7	3.0
2.2–2.3	50	1.2	1.8	2.4	1.3	1.9	2.5	1.4	2.0	2.6	75	2.0	2.3	2.6
2.4–2.5	50	0.8	1.4	2.0	0.9	1.5	2.1	1.0	1.6	2.2	75	1.6	1.9	2.2
2.6–2.7	50	0.4	1.0	1.6	0.5	1.1	1.7	0.6	1.2	1.8	75	1.2	1.5	1.8
2.8–2.9	50	–	0.6	1.2	–	0.7	1.3	–	0.8	1.4	50	0.8	1.1	1.4
3.0–3.1	50	–	–	0.8	–	–	0.9	–	–	1.0	50	–	0.7	1.0
3.2–3.3	50	–	–	0.4	–	–	0.5	–	–	0.6	50	–	–	0.6

NOTES:

1. STYROFOAM® HIGH LOAD - 40 COMPRESSIVE STRENGTH = 40 PSI
2. MINIMUM OF 0.25m OF COMPACTED BACKFILL MATERIAL (AS PER CURRENT STANDARD SPECIFICATIONS ROADS CONSTRUCTION) IS REQUIRED OVER THE INSULATION PRIOR TO TRAFFIC LOADING
3. BOTTOM OF VERTICAL STYROFOAM LEGS SHOULD BE LEVEL WITH BOTTOM OF PIPE
4. APPROVAL REQUIRED AS PER CURRENT STANDARD SPECIFICATIONS WATERWORKS SEC. 504.04.15
5. WHERE PIPE IS INSTALLED IN SOLID ROCK, PIPE IS TO BE BOXED IN COMPLETELY. PRIOR APPROVAL IS REQUIRED FOR SUCH INSTALLATIONS.

WHEATLAND COUNTY
Where There's Room to Grow

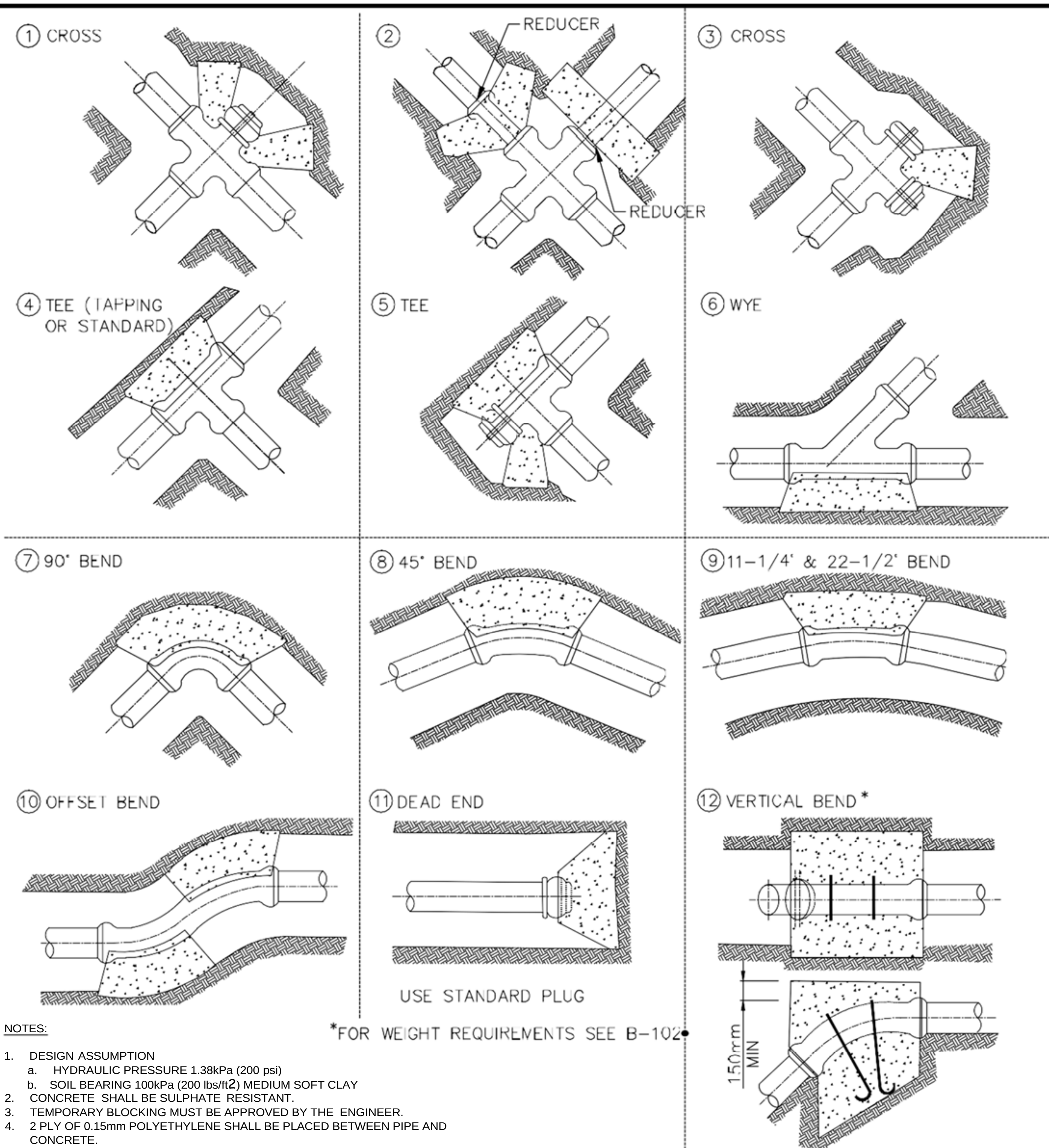
MUNICIPAL STANDARD

STYROFOAM INSULATION

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: A-105



*FOR WEIGHT REQUIREMENTS SEE B-102

NOTES:

1. DESIGN ASSUMPTION
   a. HYDRAULIC PRESSURE 1.38kPa (200 psi)
   b. SOIL BEARING 100kPa (200 lbs/ft2) MEDIUM SOFT CLAY
2. CONCRETE SHALL BE SULPHATE RESISTANT.
3. TEMPORARY BLOCKING MUST BE APPROVED BY THE ENGINEER.
4. 2 PLY OF 0.15mm POLYETHYLENE SHALL BE PLACED BETWEEN PIPE AND CONCRETE.
5. CONCRETE SHALL BE 20MPa AT 28 DAY STRENGTH MAX SLUMP 75mm.
6. THRUST BLOCKS AS PER STD. SPEC. 504.05.03

* IN DISTURBED GROUND (COMPACTED BACKFILL INCREASE BEARING AREA BY 50%

DEGREE OF BEND	SIZE OF BEND (mm)					
	100	150	200	250	300	400
90°	0.8	1.5	2.7	4.2	6.1	10.7
45°	0.4	0.1	1.5	2.3	3.4	5.7
22 1/2°	0.4	0.8	0.9	1.1	1.9	3.1
11 1/4°	0.4	0.4	0.5	0.8	1.1	1.5

*BEARING AREA OF BLOCKS

TYPE OF FITTING	CONCRETE AREAS IN SQUARE METRES					
PIPE SIZE	100	150	200	250	300	400
1,4,11	0.2	0.4	0.7	1.0	1.4	1.9
3,5,7	0.3	0.5	0.9	1.4	2.0	2.7
2				0.5	0.7	1.6
6,8,12	0.2	0.3	0.5	0.6	1.1	1.4
9	0.1	0.2	0.3	0.4	0.6	0.7
10	0.3	0.6	1.0	1.2	2.2	2.9

WHEATLAND COUNTY
Where There's Room to Grow

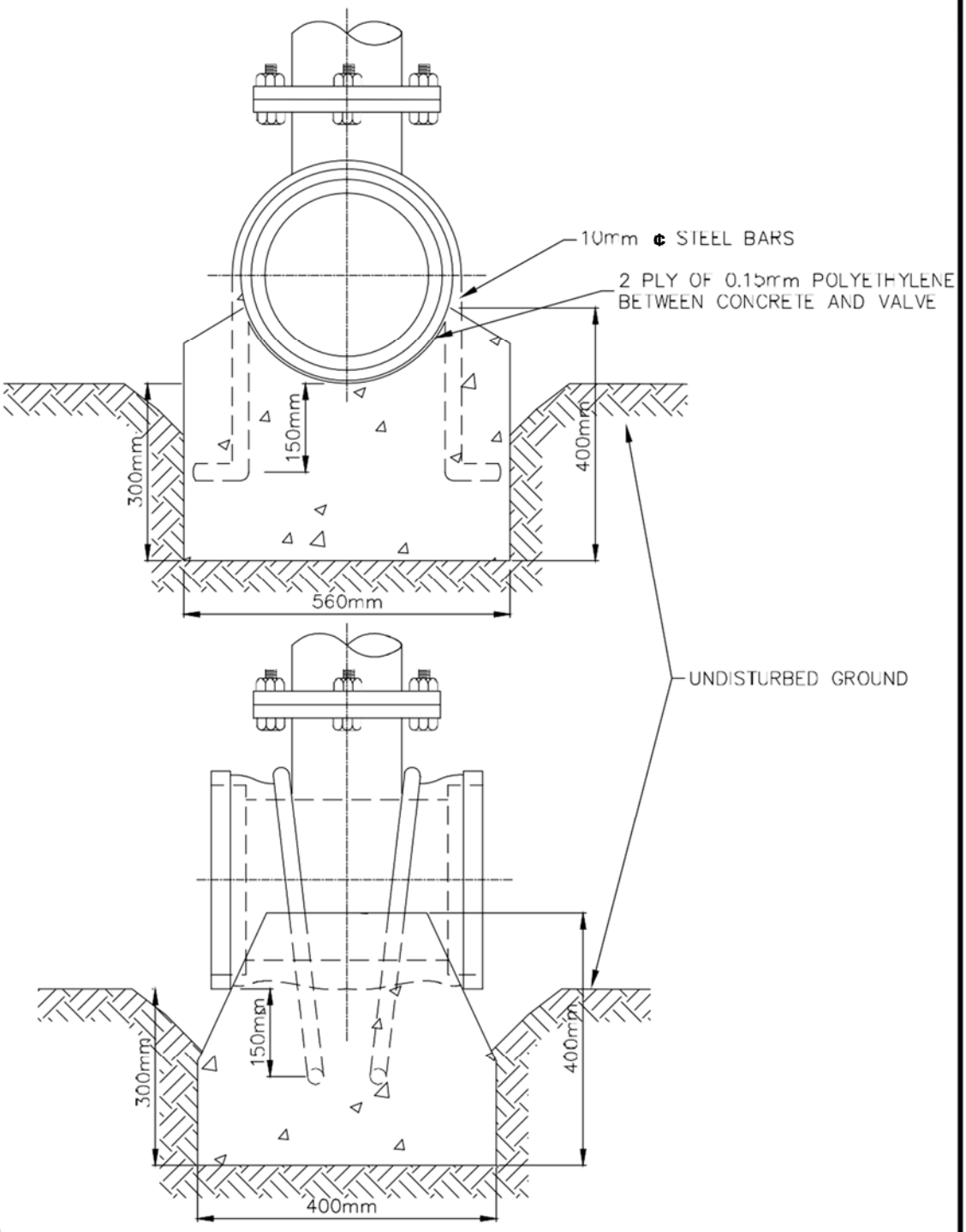
MUNICIPAL STANDARD

THRUST BLOCKS

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: B-101



NOTE:

1. SEE SECTION 504.05.00.
2. ANCHOR RODS SHALL BE PLACED AS SHOWN OR THROUGH TIE BACK HOLES ON VALVES.
3. CONCRETE SHALL BE 20 MPa AT 28 DAYS, AND SULFATE RESISTANT.

WHEATLAND COUNTY
Where There's Room to Grow

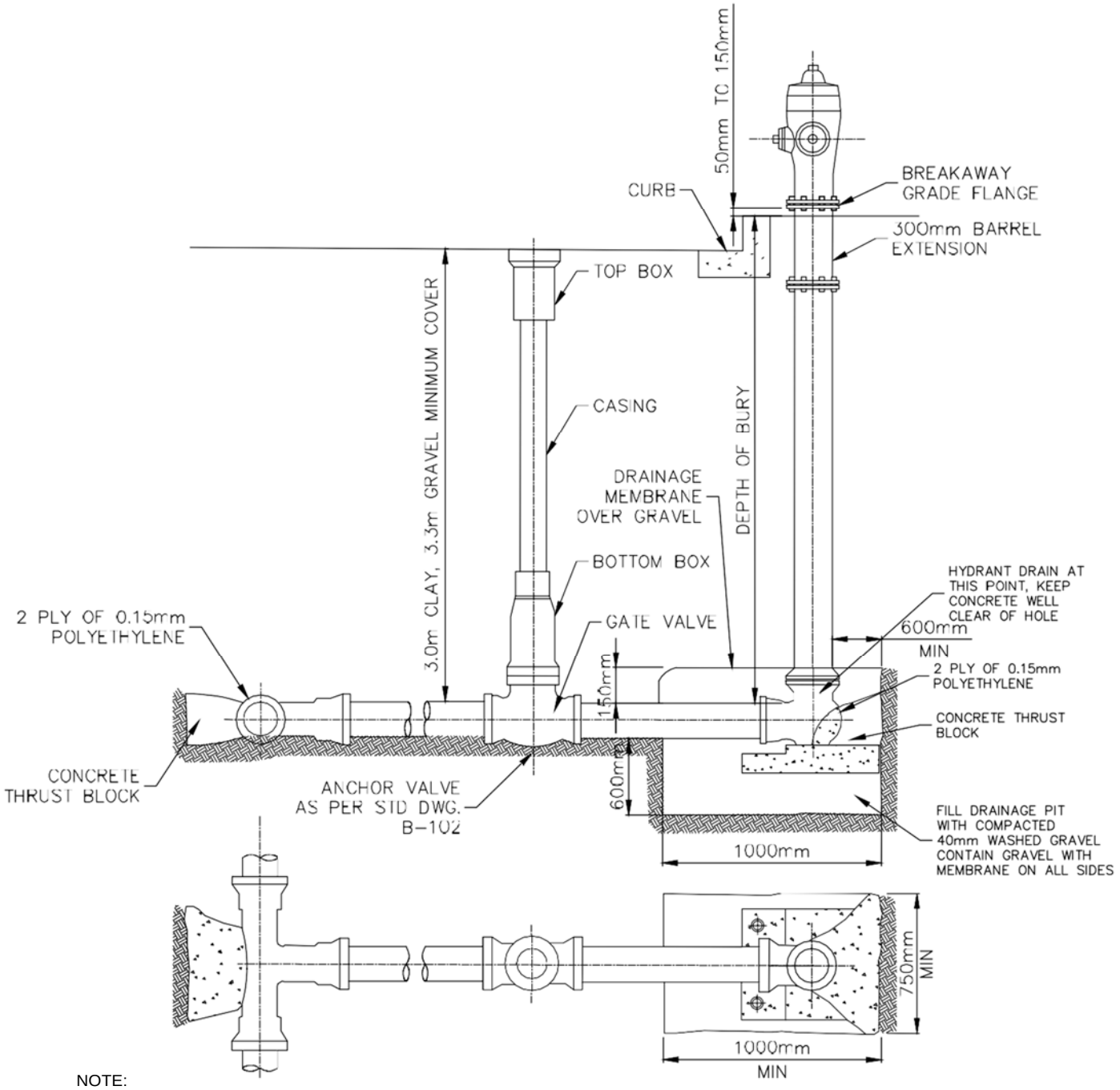
MUNICIPAL STANDARD

VALVE ANCHORING DETAILS

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: B-102



NOTE:

1. THE EXTERIOR OF THE HYDRANT SHALL BE COATED AS SPECIFIED IN SECTION 503.02.00
2. HYDRANTS IN HIGH WATER TABLE MAY BE REQUIRED TO HAVE DRAINS PLUGGED, BE PAINTED RED AND MARKED "FOR FIRE USE ONLY"
3. THE HYDRANT SHALL BE PLACED ON A CONCRETE PAD DRAINAGE MEMBRANE SHALL BE PLACED OVER THE TOP OF THE STONES TO PREVENT THE SPACES BETWEEN THE STONES FROM BEING FILLED WITH CLAY.
4. DRAINAGE MEMBRANE SHALL BE PLACED OVER THE TOP OF THE STONES TO PREVENT THE SPACES BETWEEN STONES FROM BEING FILLED WITH CLAY.
5. INSTALLATION, SEE 504.05.00
6. PLACE 2 PLY OF 0.15mm POLYETHYLENE BETWEEN PIPE AND POURED CONCRETE.
7. CONCRETE SHALL BE SULFATE RESISTANT, 20 MPa AT 28 DAYS.
8. DRAINAGE MEMBRANE, SEE SEC 319.00.00, STD SPEC. ROADS CONSTRUCTION.
9. FOR CATHODIC PROTECTION REQUIREMENTS SEE SECTION 504.07.00

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Where There's Room to Grow

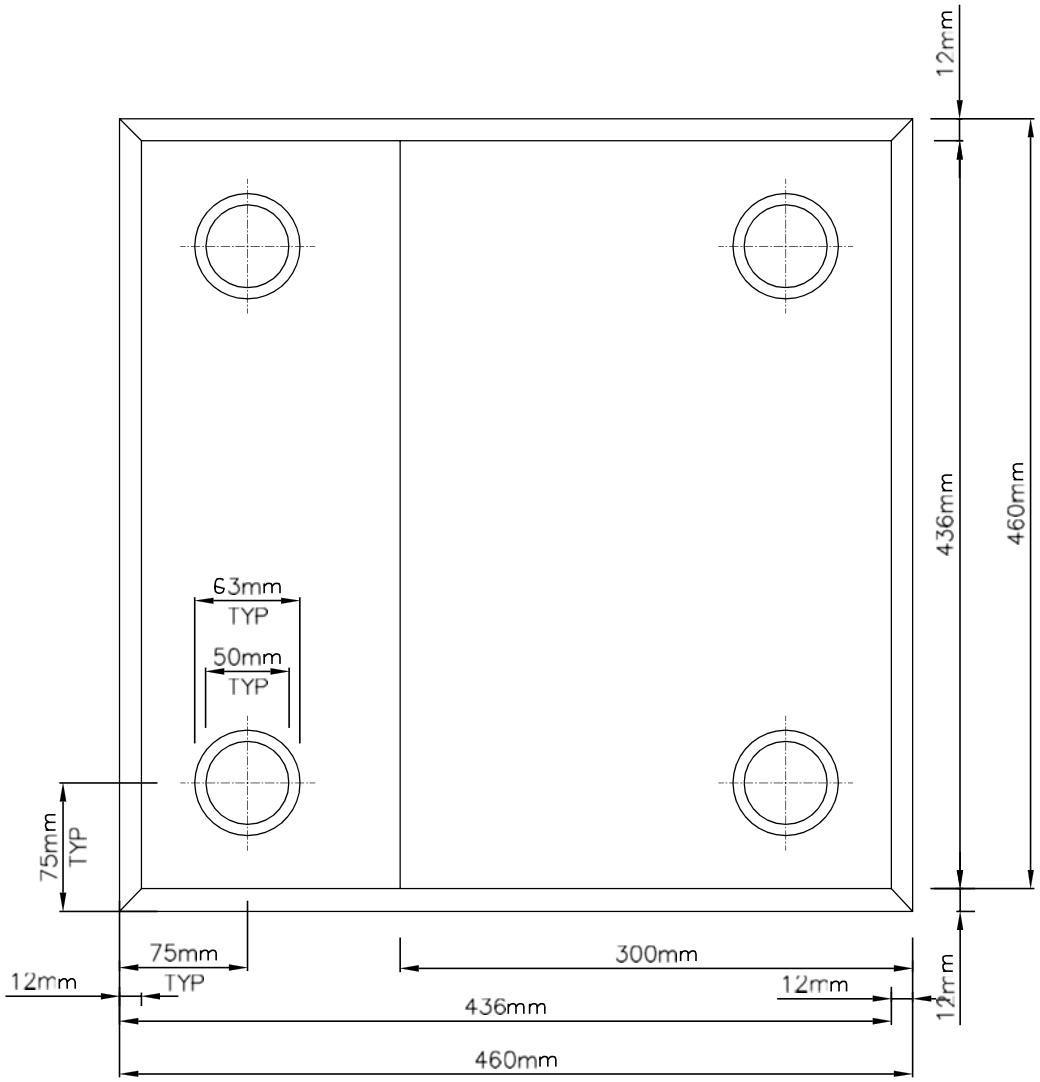
MUNICIPAL STANDARD

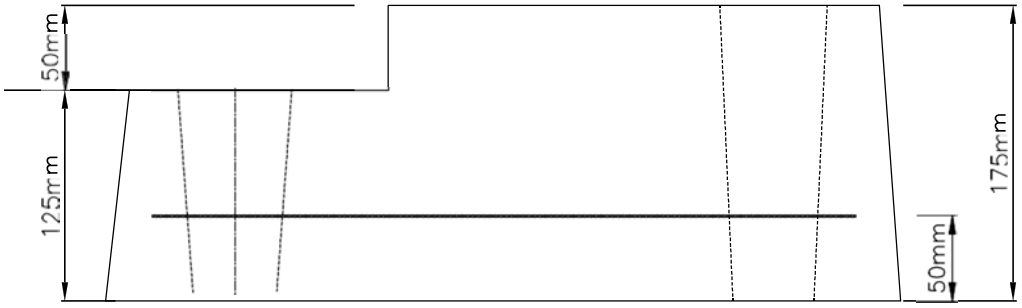
HYDRANT DETAILS

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: B-103





NOTES:

1. CONCRETE SHALL BE 20 mm 20 MPa AT 28 DAY STRENGTH
2. CONCRETE SHALL BE SULFATE RESISTANT
3. 102 X 102 W16.7/W16.7 WIRE MESH

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
PRECAST CONCRETE HYDRANT PAD	SCALE: N.T.S.
	DRAWING: B-104

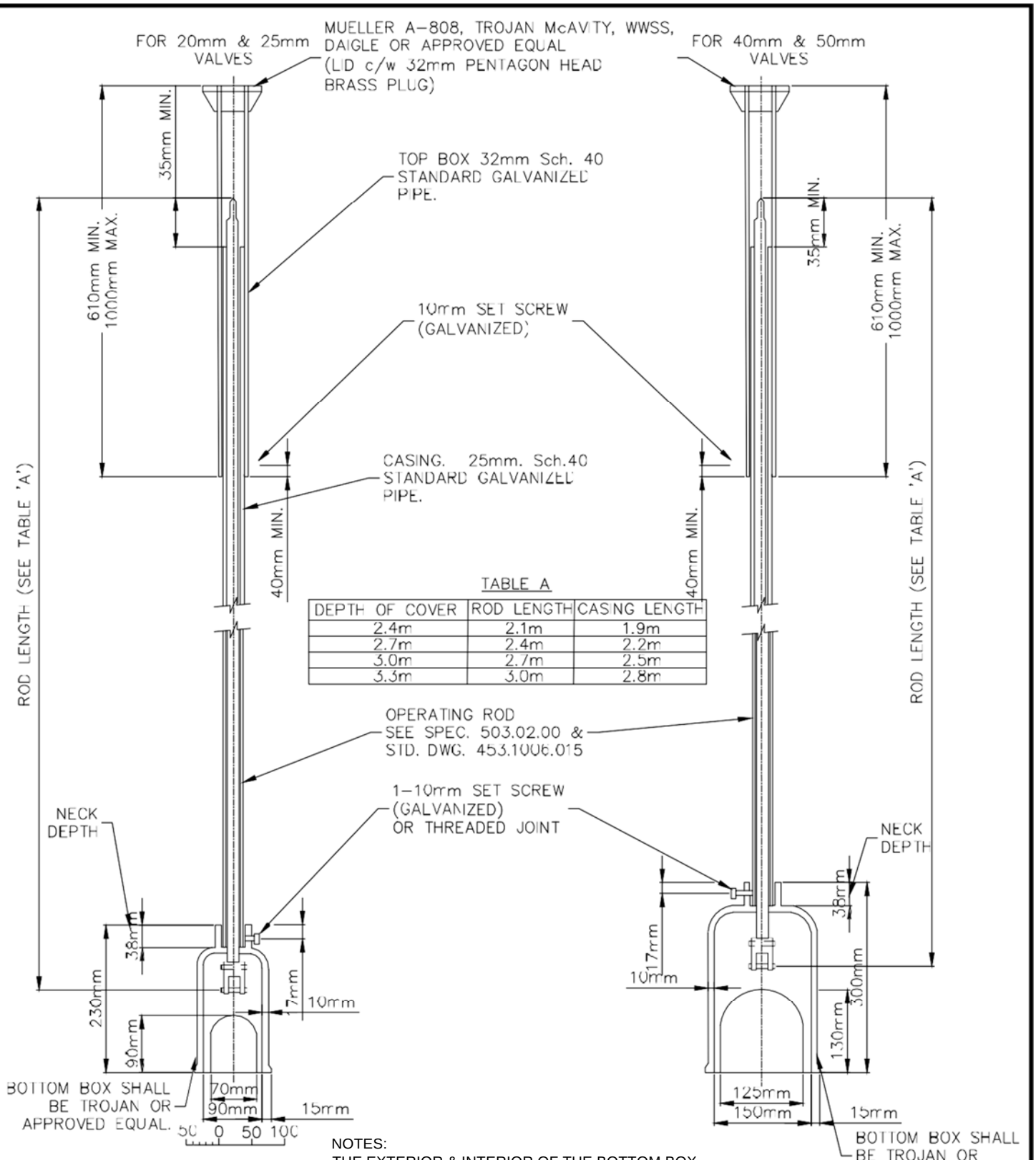


TABLE A

DEPTH OF COVER	ROD LENGTH	CASING LENGTH
2.4m	2.1m	1.9m
2.7m	2.4m	2.2m
3.0m	2.7m	2.5m
3.3m	3.0m	2.8m

NOTES:
THE EXTERIOR & INTERIOR OF THE BOTTOM BOX SHALL BE FACTORY COATED IN ACCORDANCE WITH SECTION 505.01.00 (TYPE a).

WHEATLAND COUNTY
Where There's Room to Grow

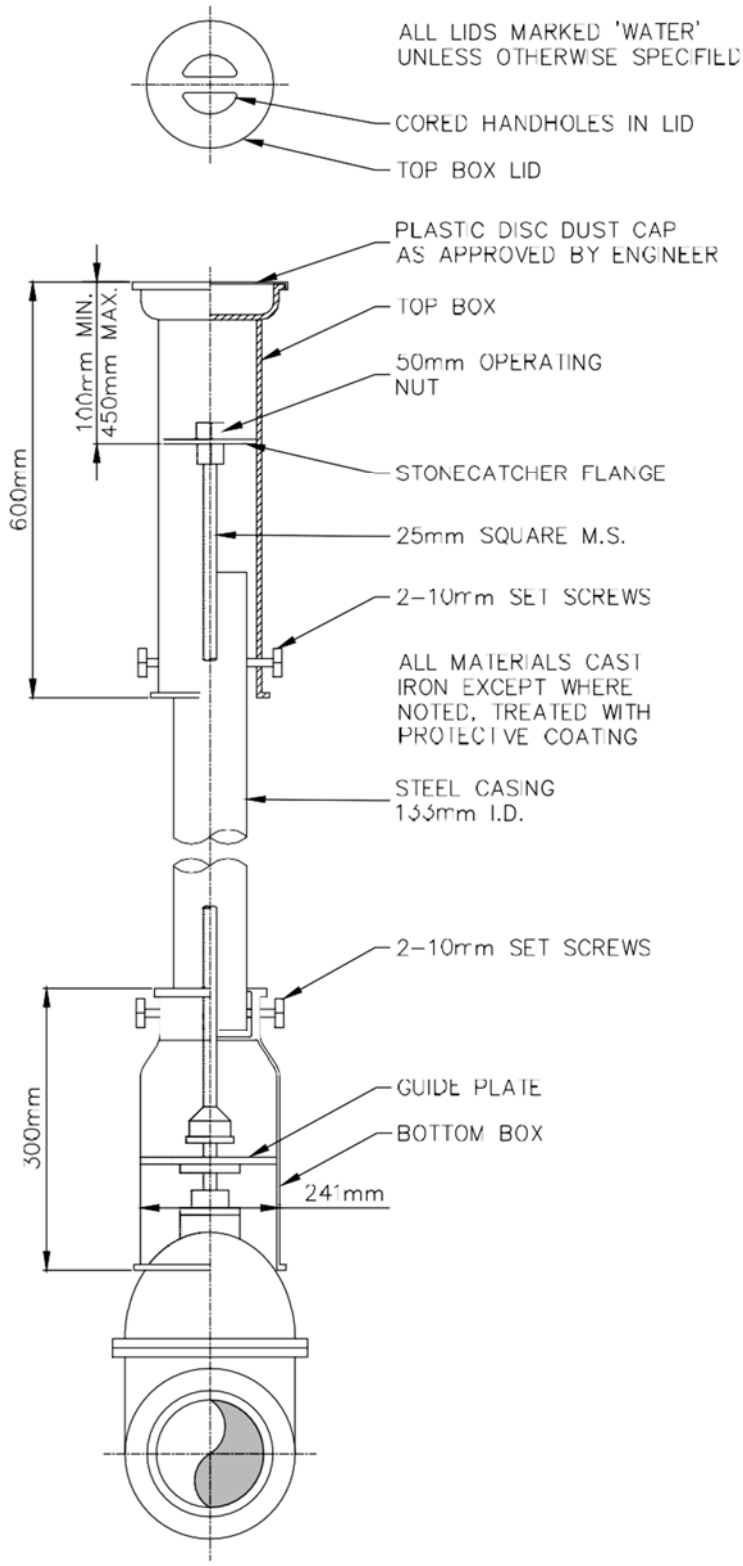
MUNICIPAL STANDARD

SERVICE VALVE
OPERATING ASSEMBLY

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: B-105



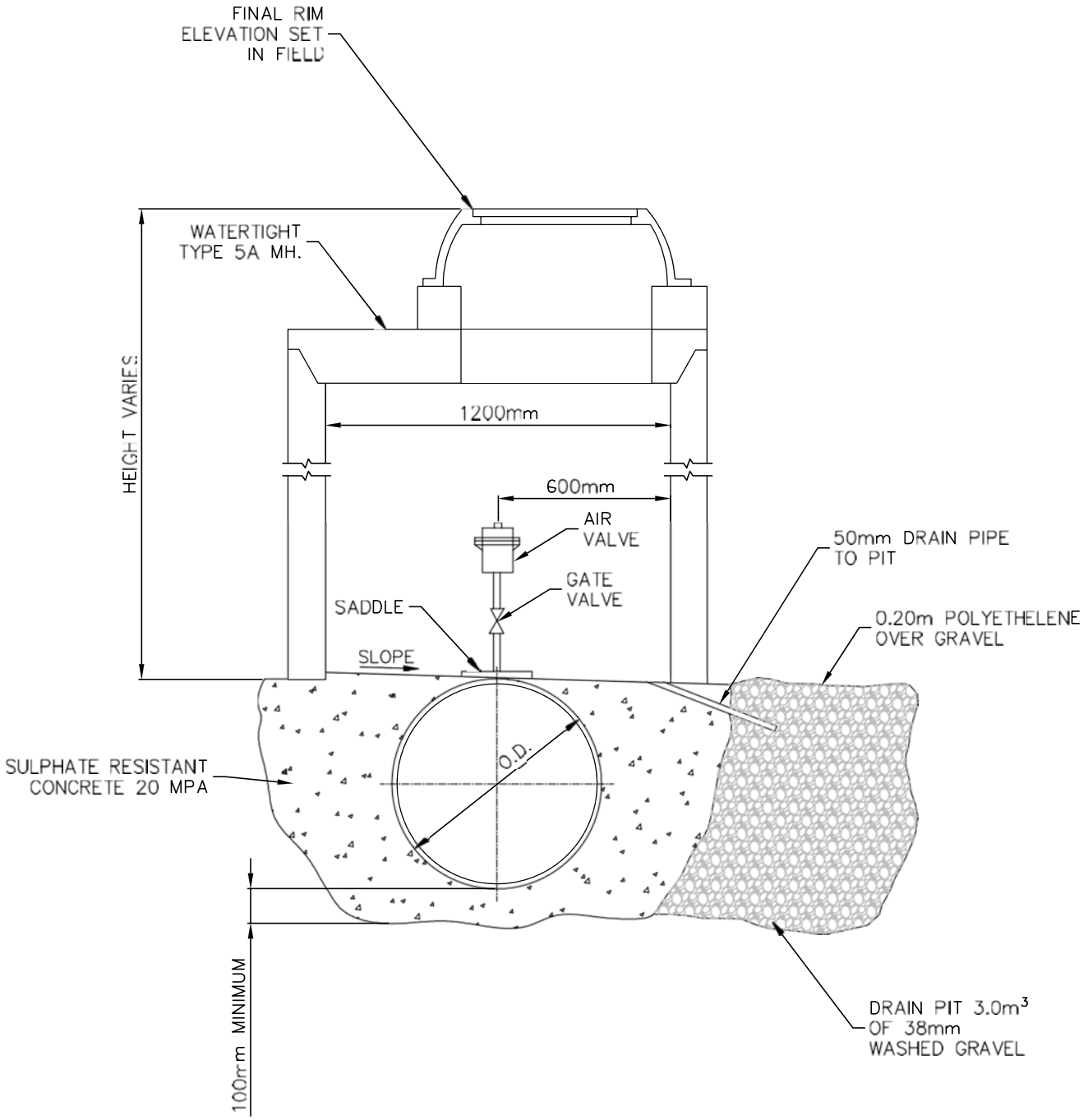
NO EXTENSIONS PERMITTED.
TYPE 'A' BARREL TO BE
ADEQUATE FOR 3m BURY,
AND MUST PERMIT REMOVAL
OR ROCK DISC.

THE TYPE 'A' VALVE BOXES ARE
CAST IRON AND COATED.
TYPE 'A' CAN BE USED ON
100 TO 300mm VALVES.

SLIDING TYPE VALVE BOX

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
TYPE 'A' VALVE BOX	SCALE: N.T.S.
	DRAWING: B-106

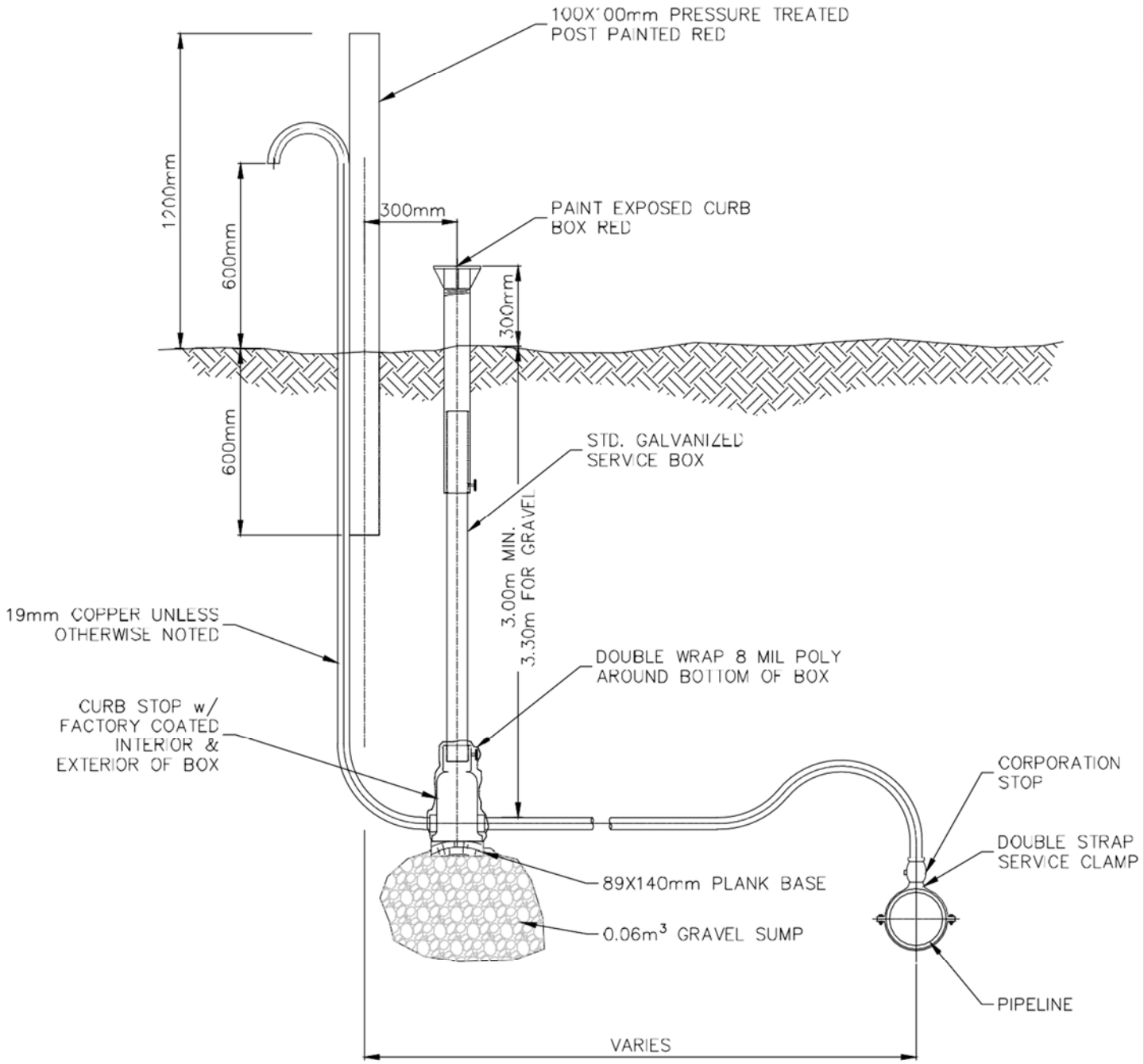


NOTE:
USE SADDLE AS SPECIFIED

WHEATLAND COUNTY
Where There's Room to Grow

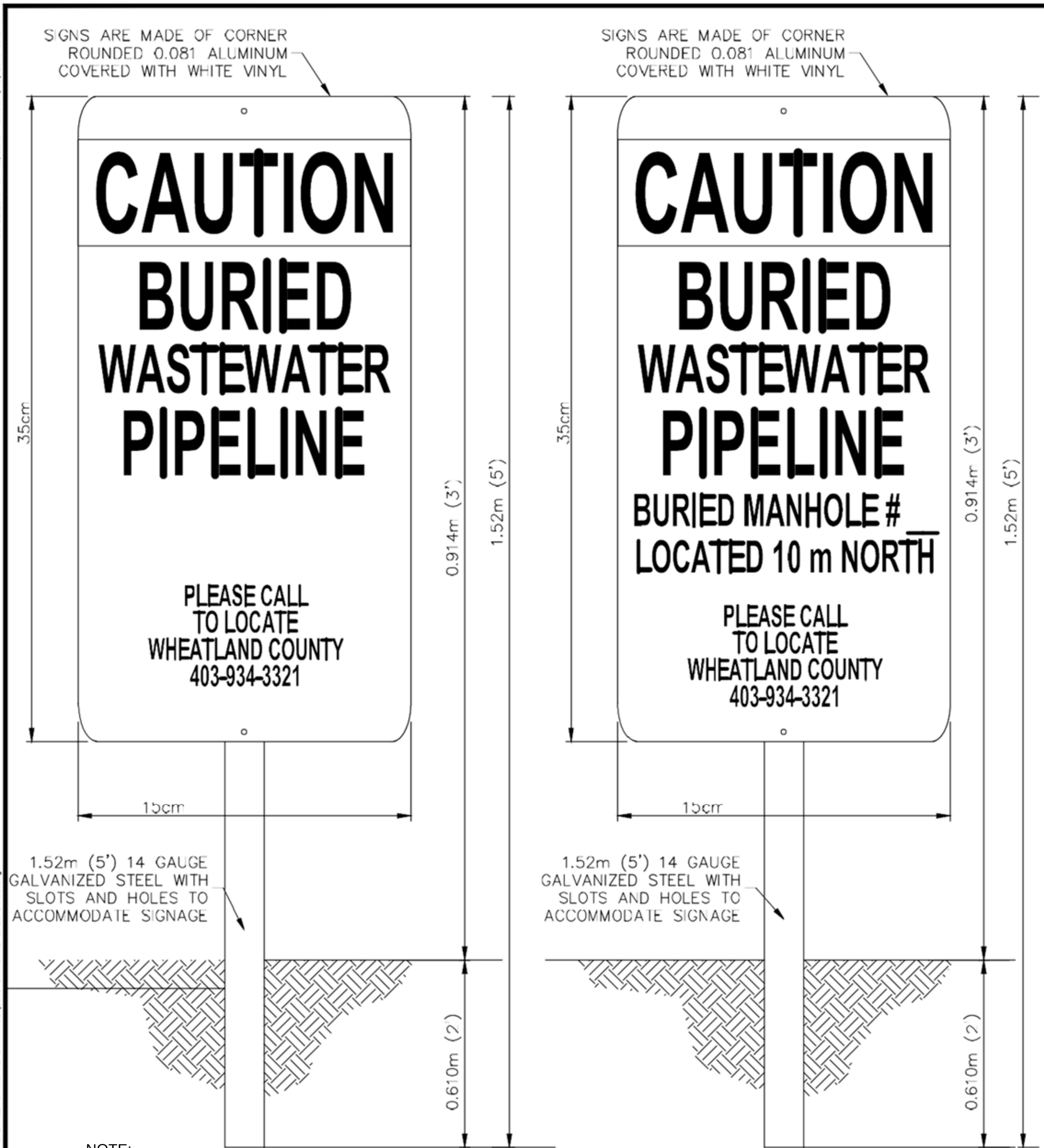
MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
AUTOMATIC AIR RELEASE ASSEMBLY	SCALE: N.T.S.
	DRAWING: B-107

NOTE:
SLOPE GROUND AWAY FROM CURB BOX



WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
MANUAL AIR RELEASE ASSEMBLY	SCALE: N.T.S.
	DRAWING: B-108



NOTE:

1. CONTRACTOR IS TO SUBMIT ONE MARKER COMPLETE FOR APPROVAL BY THE ENGINEER PRIOR TO INSTALLATION
2. ALL LETTERING AND COLORINGS SHALL BE BAKED ENAMEL FINISH PAINT OR A VINYL MATERIAL WITH VINYL INK FOR LETTERING SUCH AS 3M SCOTCHCAL, FASCON OR APPROVED EQUAL
3. SIGNS WILL BE INSTALLED AT ROAD CROSSINGS AND BURIED MANHOLES. THE ACTUAL LOCATION WILL BE DESIGNATED BY THE ENGINEER.

WHEATLAND COUNTY
Where There's Room to Grow

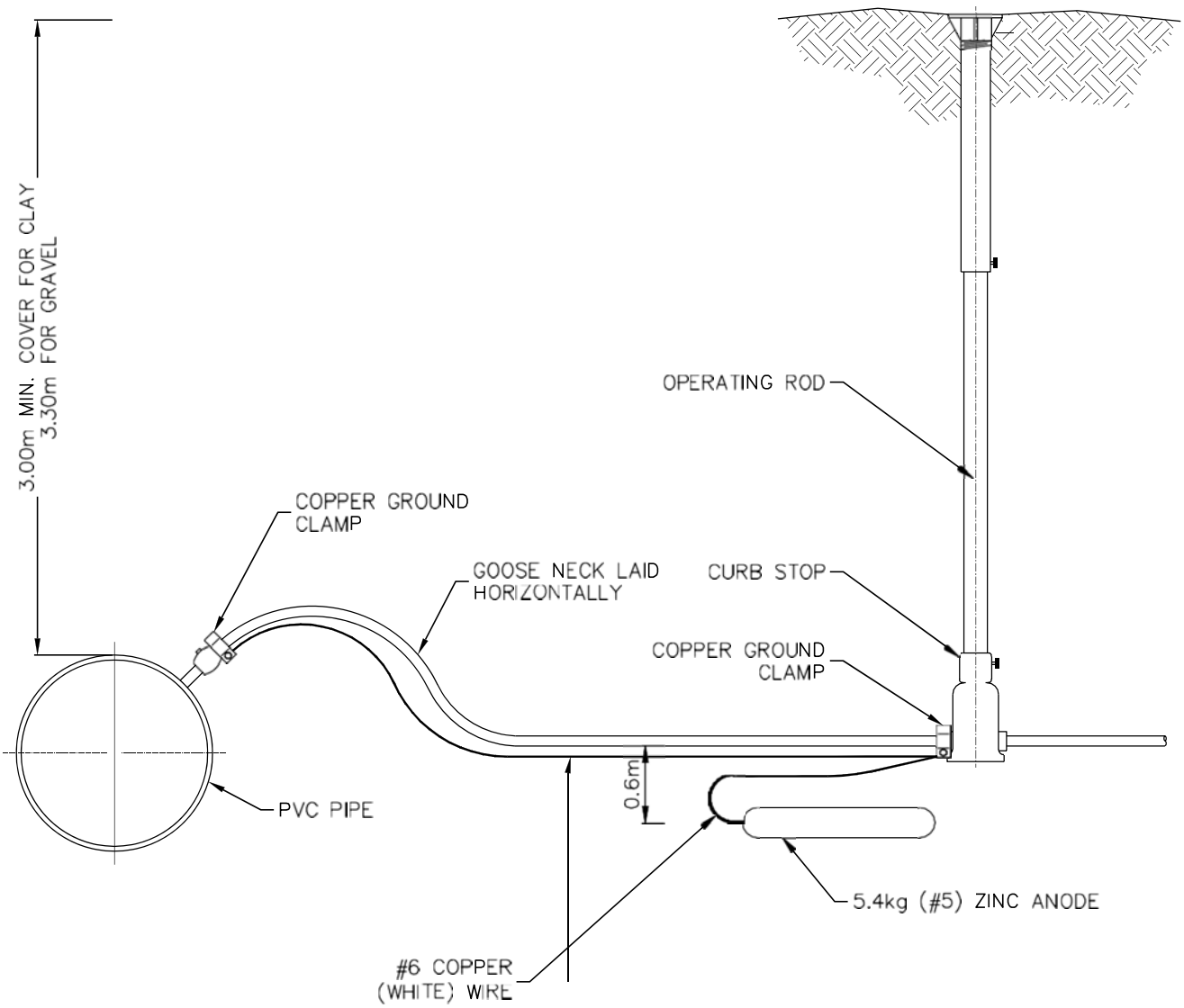
MUNICIPAL STANDARD

PIPELINE ROUTE MARKER

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: B-109



WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD

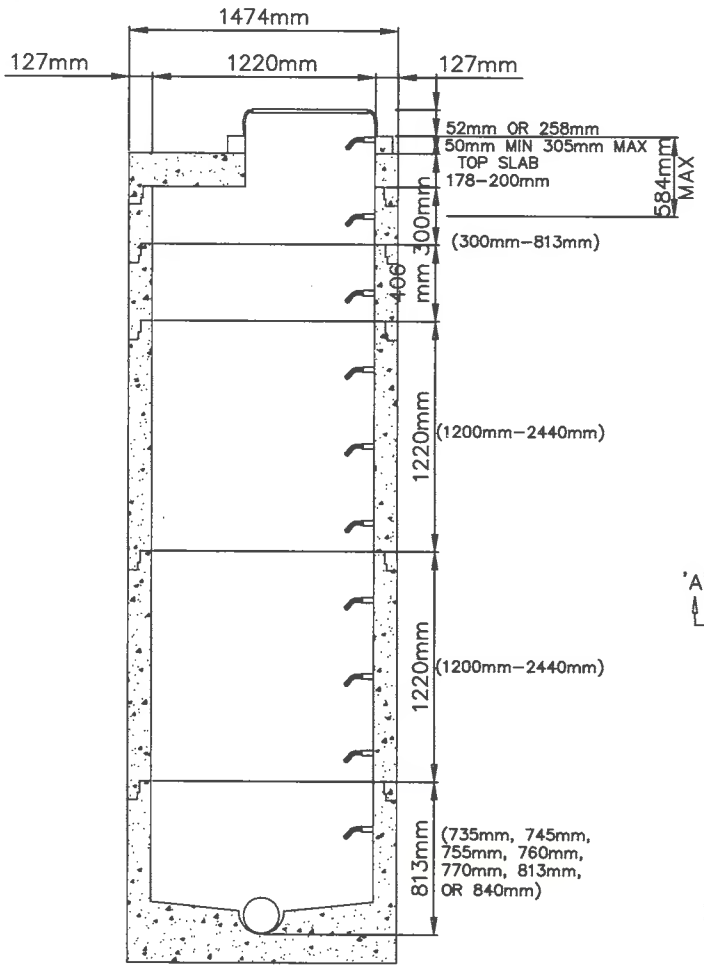
SERVICE ANODE INSTALLATION
MAIN CORPORATION AND
CURB STOPS

ISSUE DATE: JUN, 2016
SCALE: N.T.S.
DRAWING: B-110

MANHOLE COVER
- USE STANDARD MANHOLE COVER AS PER DWG SHEET #1 (452.1001.012).
- USE GRATED MANHOLE COVER AS PER DWG SHEET #2 (452.1001.011) ONLY IF CONSTRUCTION DRAWINGS INDICATE

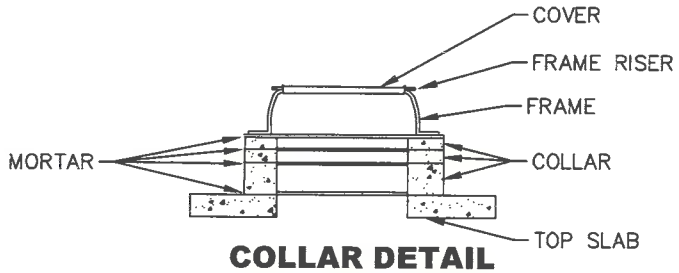
MANHOLE FRAME RISER
- USE MANHOLE FRAME RISER AS PER DWG SHEET #3 (452.1001.007).
- USE ONLY FOR FINAL ADJUSTMENTS TO GRADE.

MANHOLE FRAME
- USE STANDARD OR SHALLOW MANHOLE FRAME AS PER DWG SHEET#4 & #5 (452.1001.013) (452.1001.014) RESPECTIVELY.



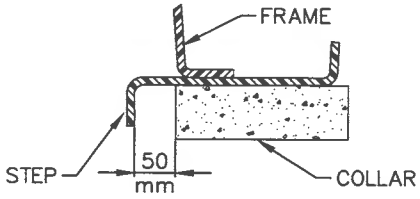
MATERIAL SPECIFICATIONS

1. HS 50 CEMENT (TYPE 50)
2. DESIGN AND REINFORCING AS PER ASTM 478M & CSA A257.4.



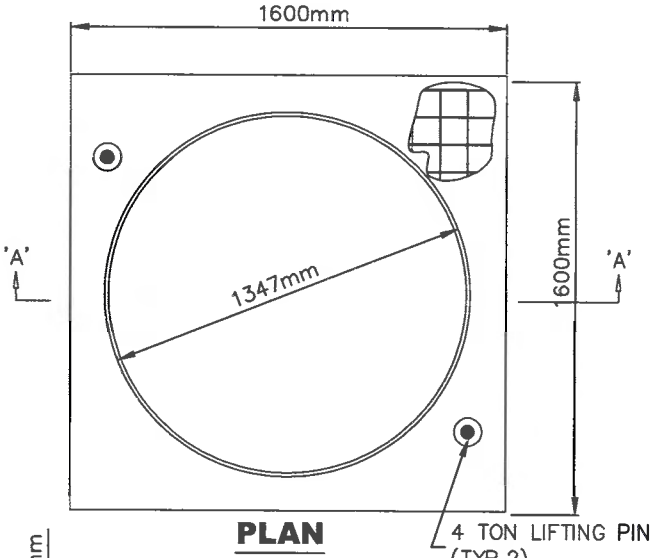
COLLAR DETAIL

NOTES:
- AN ADDITIONAL STEP IS REQUIRED TO BE INSTALLED IF THE UNDERSIDE OF THE MANHOLE FRAME EXCEEDS 584mm. SPACING BETWEEN STEPS SHALL NOT BE LESS THAN 400mm.
- MAXIMUM OF THREE COLLARS TO BE USED

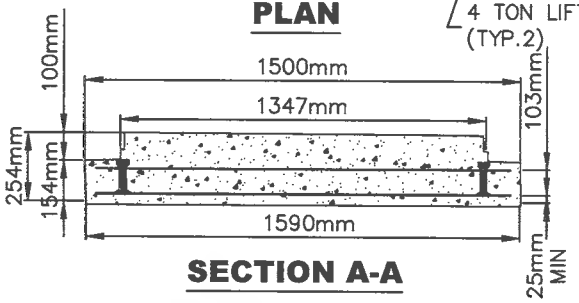


STEP DETAIL

- MANHOLE STEP TO BE INSTALLED BETWEEN FRAME AND COLLAR



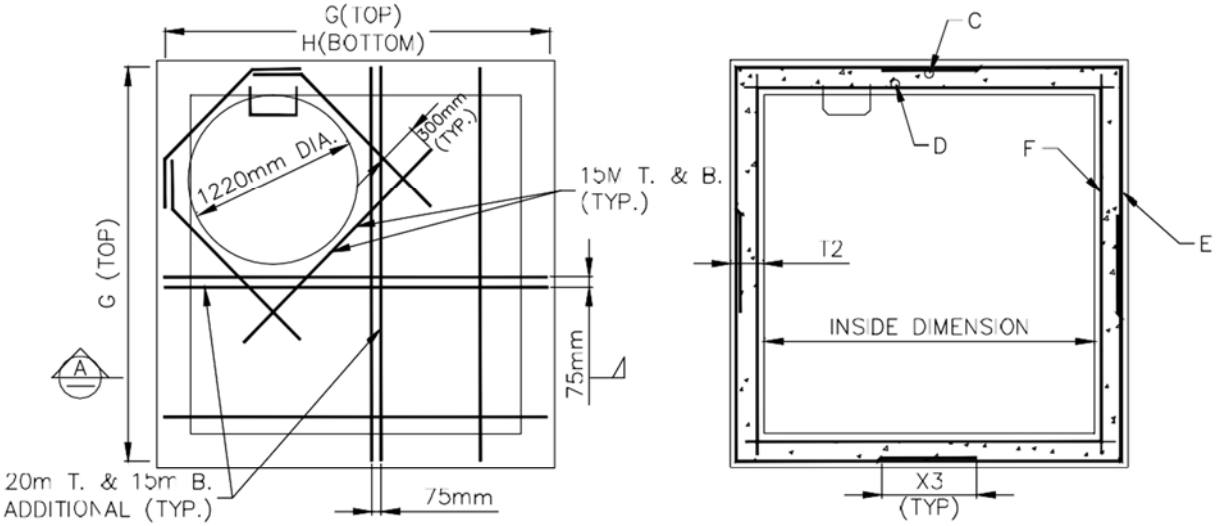
PLAN



SECTION A-A

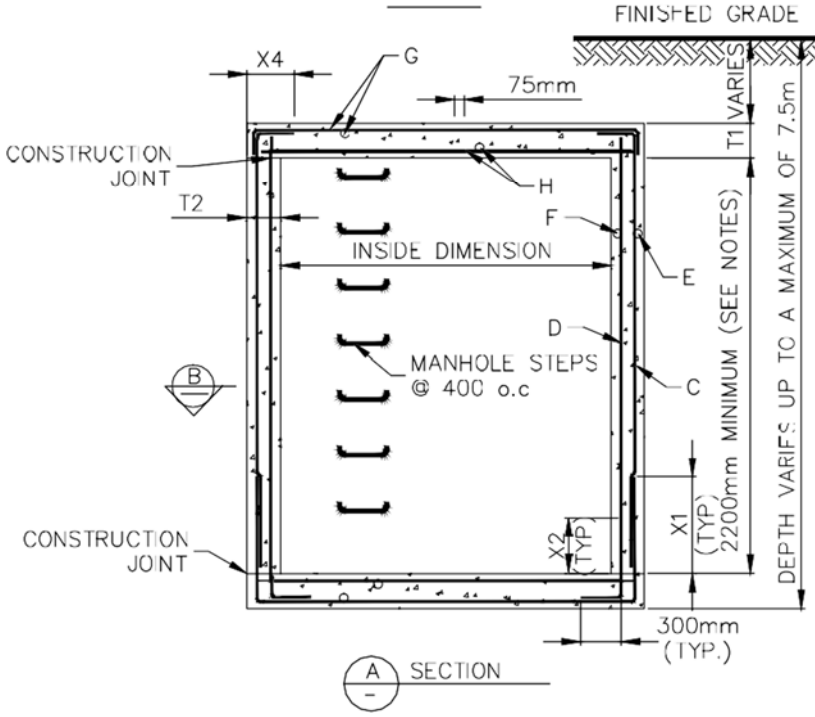
WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STANDARD MANHOLE TYPE 5A	SCALE: N.T.S.
	DRAWING: C-101



PLAN

B SECTION



A SECTION

DESIGN PARAMETERS:
THE DESIGN SHOWN IN THE TABLE ARE BASED ON THE FOLLOWING PARAMETERS:

UNIT WEIGHT OF SOIL:22kN/m3
UNIT WEIGHT OF WATER:9.8kN/M3
VEHICLE LOAD: BASED ON A CL 800 TRUCK

GROUNDWATER LEVER: 1.0m BELOW FINISHED GRADE.
LATERAL EARTH PRESSURE COEFFICIENT:0.5

MATERIAL SPECIFICATIONS:

1. CEMENT: SULPHATE-RESISTANT TYPE HS (TYPE 50) IN ACCORDANCE WITH CSA A3001 OR TYPE V IN ACCORDANCE WITH ASTN C150.
2. CONCRETE : COMPRESSIVE STRENGTH OF 30 MPa AT 28 DAYS. NOMINAL MAXIMUM SIZE OF COARSE AGGREGATE TO BE NO GREATER THAN 28mm.
3. AIR CONTENT: 4 AND 7% EXCEPT WHERE NO-SLUMP CONCRETE IS USED
4. REINFORCING STEEL: DEFORMED BARS IN ACCORDANCE WITH CSA G30.18. Fy=400 MPa.
5. CONCRETE CLEAR COVER:

- CAST AGAINST EARTH:75mm
- EXPOSED TO EARTH AND GROUNDWATER: 40mm
- EXPOSED TO SEWER WATER OR CHLORIDES: 60mm

NOTES:
DO NOT USE THE DESIGNS SHOWN IN THE TABLE FOR ANY INSTALLATION THAT WILL BE SUBJECTED TO LOADS GREATER THAN THAT INDICATED BY THE DESIGN PARAMETERS.

DISTANCE BETWEEN THE TOP OF BENCHING AND THE UNDERSIDE OF THE TOP SLAB TO BE NOT LESS THAN 2200mm.

DISTANCE BETWEEN THE BOTTOM STEP AND TOP OF BENCHING NOT TO EXCEED 400mm.

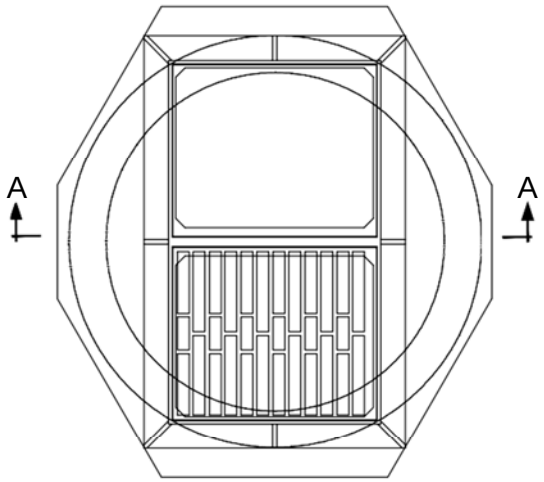
	INSIDE DIMENSIONS	T3	BOTTOM SLAB		LAP X1	LAP X2	T2	WALLS				LAP X3	T1	TOP SLAB		LAP X4
			A	B				C	D	E	F			G	H	
*	1220 X 1220	225	10M @ 250	15M @ 250	550	400	225	15M @ 250	10M @ 500	10M @ 250	10M @ 500	400	275	15M @ 250	10M @ 250	550
	1525 X 1525	225	10M @ 250	15M @ 250	550	400	225	15M @ 250	10M @ 500	15M @ 300	10M @ 300	550	275	15M @ 250	10M @ 250	550
	1830 X 1830	250	10M @ 200	20M @ 200	700	400	225	20M @ 200	10M @ 400	15M @ 350	15M @ 350	550	275	15M @ 200	15M @ 400	700
	2135 X 2135	250	15M @ 400	20M @ 200	700	400	225	20M @ 200	10M @ 400	20M @ 350	15M @ 350	700	275	20M @ 200	14M @ 400	700
	2440 X 2440	250	15M @ 250	20M @ 250	700	400	250	20M @ 250	10M @ 250	20M @ 400	15M @ 400	700	275	20M @ 250	15M @ 250	700
	2745 X 2745	250	15M @ 400	20M @ 200	700	550	250	20M @ 200	15M @ 400	20M @ 300	15M @ 300	700	275	20M @ 200	15M @ 200	700
	3050 X 3050	300	15M @ 400	20M @ 200	700	550	300	20M @ 200	15M @ 400	20M @ 350	15M @ 350	700	300	20M @ 200	15M @ 200	700
	3660 X 3660	300	15M @ 300	20M @ 150	700	550	300	20M @ 150	15M @ 300	20M @ 200	15M @ 200	700	300	20M @ 150	15M @ 150	700

WHEATLAND COUNTY
Where There's Room to Grow

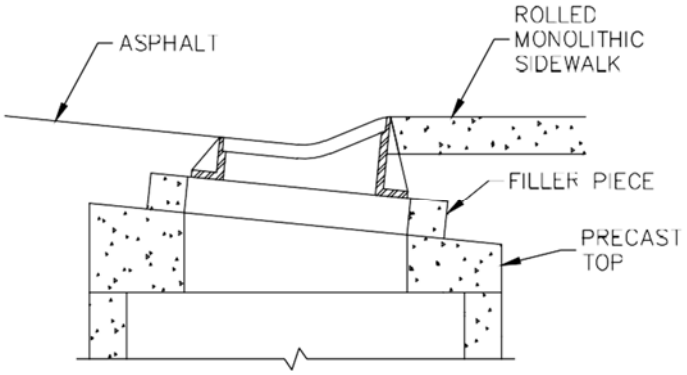
MUNICIPAL STANDARD

STANDARD MANHOLE
TYPE "1" MANHOLE

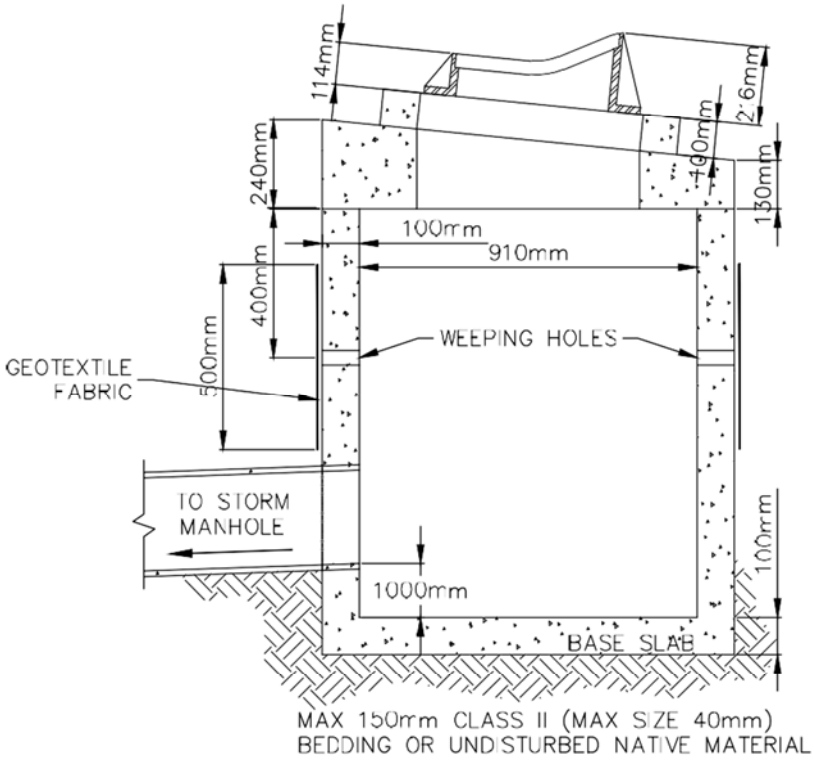
ISSUE DATE: JUN, 2016
SCALE: N.T.S.
DRAWING: C-102



PLAN



CATCH BASIN & SIDEWALK



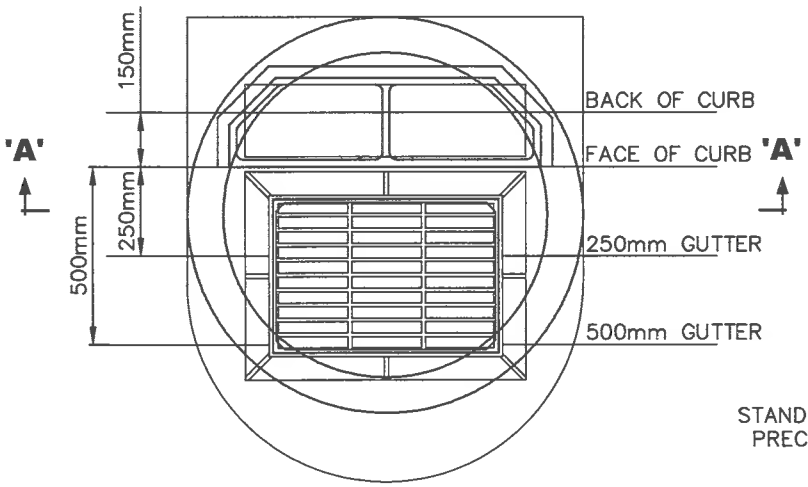
SECTION 'A - A'

NOTE:

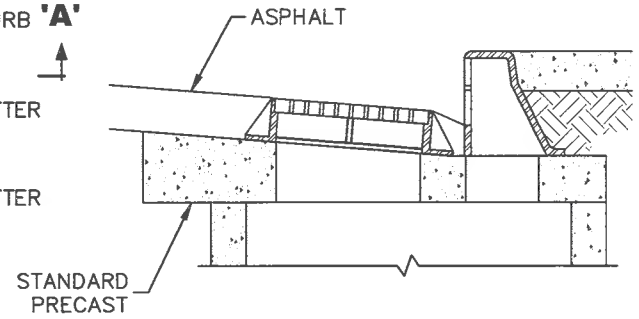
1. PRECAST CATCH BASIN BARRELS TO CONFORM TO ASTM C-478 (LATEST EDITION)

WHEATLAND COUNTY
Where There's Room to Grow

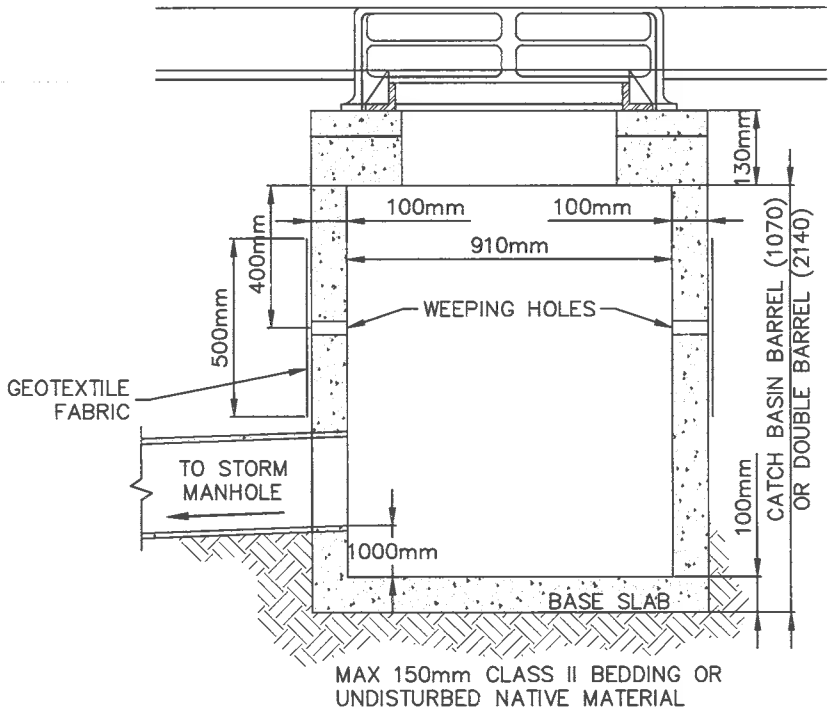
MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STORM PRECAST CATCH BASIN TYPE 'K-2' ASSEMBLY WITH SUMP	SCALE: N.T.S.
	DRAWING: C-103



PLAN



CATCH BASIN & SIDEWALK



SECTION 'A - A'

NOTE:
1. PRECAST CATCH BASIN BARRELS TO CONFORM TO ASTM C-478 (LATEST EDITION)

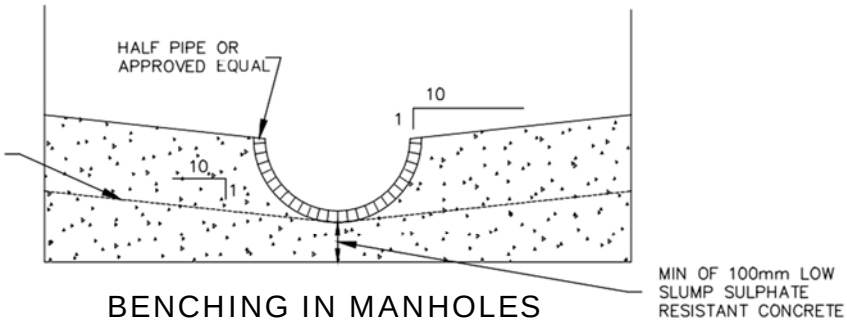
WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STANDARD CATCH BASIN TYPE 'C' WITH SUMP	SCALE: N.T.S.
	DRAWING: C-104

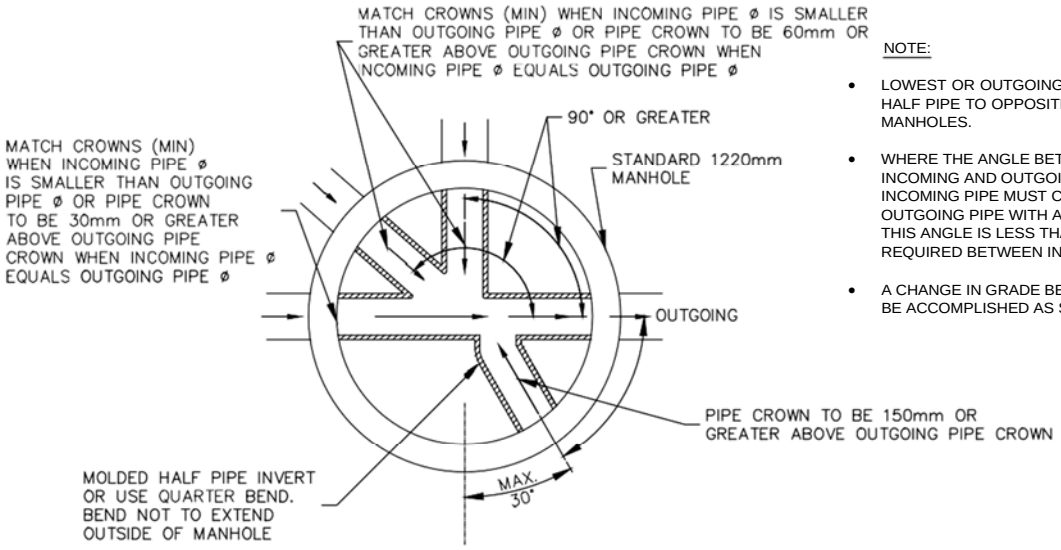
- STANDARD SIDE SLOPE OF BENCHING 10:1 FROM HALF WAY UP PIPE IN ALL CASES
- ALL CONCRETE SHALL BE 30MPa IN 28 DAYS

STORM BENCHING ON PIPE DIAMETER GREATER THAN 600mm AND ALL SKIMIIMG MANHOLES.

- SANITARY–HALF PIPE OR APPROVED EQUAL SHALL FORM THE INVERT.
- STORM – SAME BENCHING AS SANITARY FOR PIPE DIAMETER LESS THAN OR EQUAL TO 600mm
- ALL CHANNELS ARE TO BE SIZE ON SIZE. CHANNELS ONE PIPE SIZE LARGER WILL BE ACCEPTED

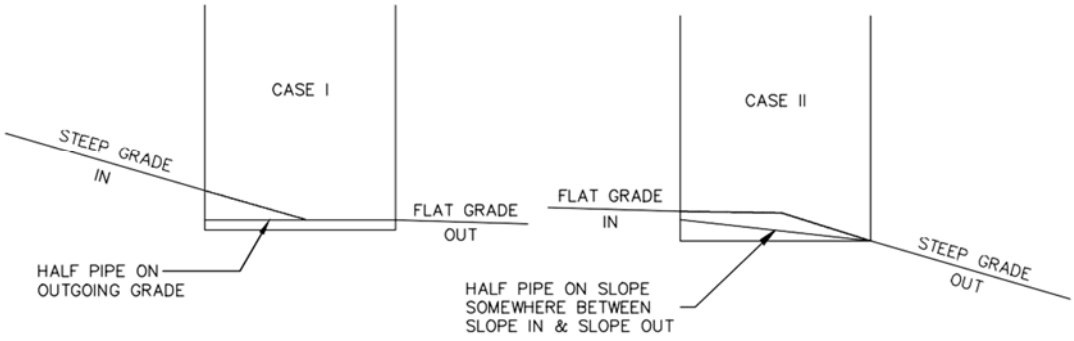


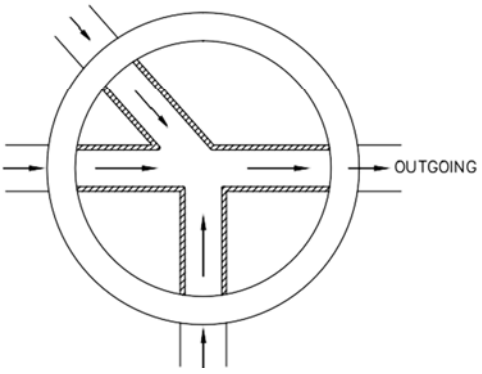
BENCHING IN MANHOLES



NOTE:

- LOWEST OR OUTGOING PIPE TO GO STRAIGHT THROUGH MH WITH HALF PIPE TO OPPOSITE WALL IN ALL CASES INCLUDING DEAD END MANHOLES.
- WHERE THE ANGLE BETWEEN THE DIRECTION OF FLOW IN THE INCOMING AND OUTGOING PIPES IS 90° OR GREATER, THEN THE INCOMING PIPE MUST COME STRAIGHT TO INTERSECT WITH THE OUTGOING PIPE WITH A HALF PIPE SET IN MAIN BENCHING, WHERE THIS ANGLE IS LESS THAN 90°. THEN A MINIMUM OF 150mm DROP IS REQUIRED BETWEEN INCOMING AND OUTGOING INVERTS.
- A CHANGE IN GRADE BETWEEN INCOMING & OUTGOING PIPES MAY BE ACCOMPLISHED AS SHOWN IN CASE I AND CASE II.





SANITARY SEWERS:

- USE SANITARY DROP MANHOLE WHEN INCOMING PIPE INVERT IS 760mm OR GREATER ABOVE OUTGOING PIPE CENTERLINE.
- HAVE INLET FLOW DROP INTO HALF PIPE SET IN MAIN BENCHING AND RUNNING STRAIGHT TO INTERSECTON WITH OUTGOING PIPE.
- HALF PIPE STRAIGHT THROUGH ON OUTGOING SLOPE.

WHEATLAND COUNTY
Where There's Room to Grow

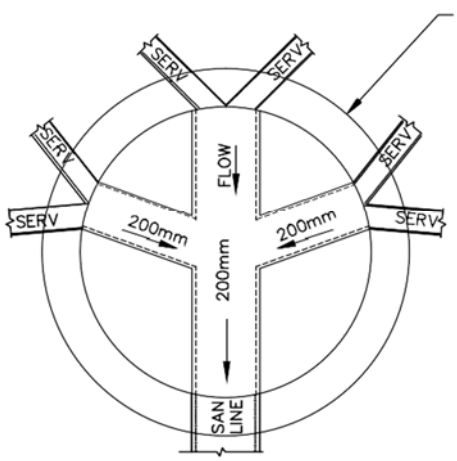
MUNICIPAL STANDARD

BENCHING STANDARDS FOR SEWER MANHOLES

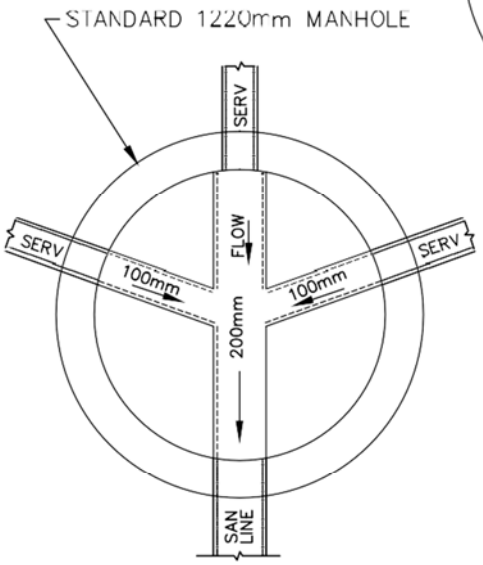
ISSUE DATE: JUN, 2016

SCALE: N.T.S.

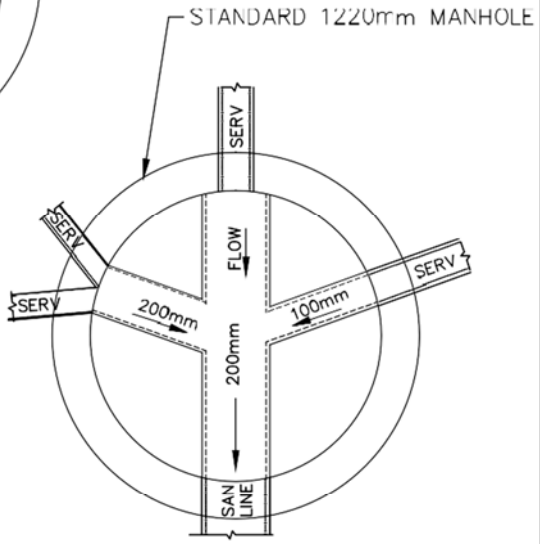
DRAWING: C-105



TYPICAL



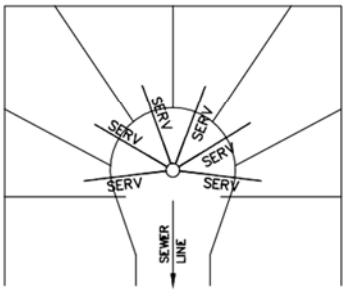
ALTERNATE #1



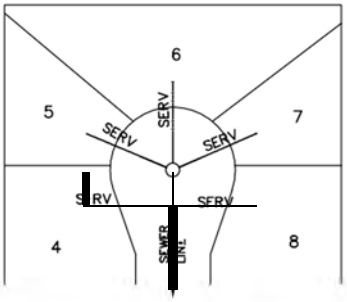
ALTERNATE #2

NOTE:

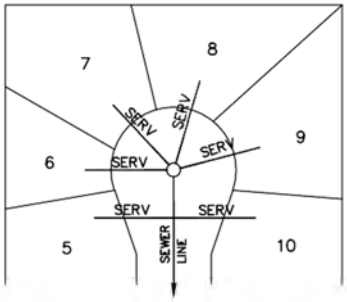
1. IN THE CASE OF MORE THAN 6 CONNECTION INTO A MANHOLE, A DETAIL DRAWING SHALL BE SUBMITTED TO THE ENGINEER FOR APPROVAL.
2. SEWER MAIN TO GO STRAIGHT THROUGH MANHOLE WITH 0.50 PIPE TO OPPOSITE WALL.
3. MAXIMUM HEIGHT OF INLET 300mm ABOVE INVERT OF OUTLET.
4. 0.50 PIPE BENCHING TO ACCOMMODATE BRANCH CONNECTIONS.
5. SERVICE CONNECTIONS INTO BARREL TO BE MACHINE CORED.
6. MIN. 100mm FOR 1 SERVICE. MIN 200mm FOR 2 SERVICES
7. FOR BENCHING DETAIL SEE C-110



TYPICAL



ALTERNATE #1



ALTERNATE #2

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD

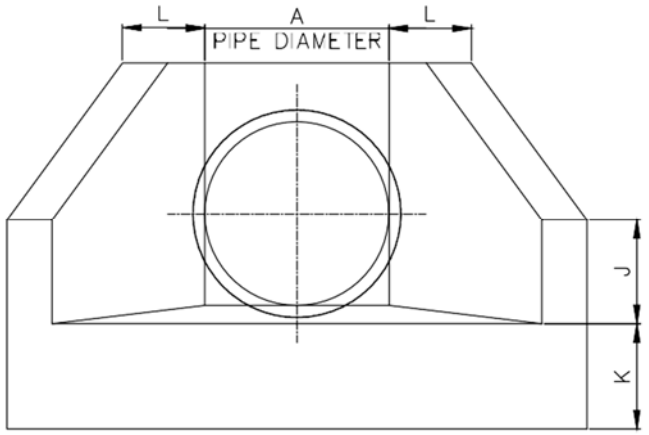
SERVICE CONNECTION DETAILS FOR SANITARY SEWER MANHOLE IN CUL-DE-SAC

ISSUE DATE: JUN, 2016

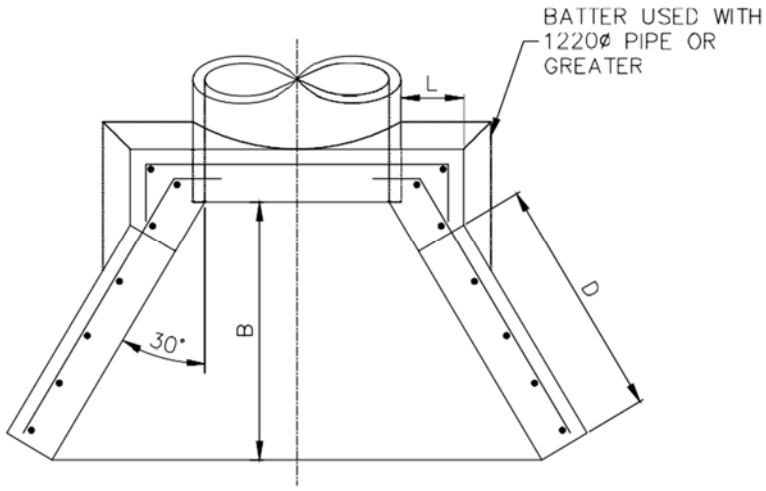
SCALE: N.T.S.

DRAWING: C-106

PIPE DIA. A	B	C	D	E	F	G	H	J	K	L	M	REINFORCING: WING WALLS	REINFORCING: REMAINDER
≦450	914	150	1054	150	200	50	200	300	225	250	NIL	100x100 10/10	#3 @ 150mm
600	1067	150	1270	150	200	50	200	300	225	250	NIL	100x100 10/10	#3 @ 150mm
750	1220	200	1470	200	275	75	225	300	275	275	NIL	100x100 10/10	#4 @ 150mm
900	1372	200	1619	200	275	75	225	300	275	275	NIL	100x100 10/10	#4 @ 150mm
1050	1524	250	1759	225	300	75	250	300	300	300	NIL	100x100 10/10	#4 @ 150mm
1200	1676	250	1975	300	400	100	250	600	400	300	200	100x100 10/10	#4 @ 150mm
1350	1829	275	2115	300	400	100	300	600	400	350	250		
1500	1981	300	2324	300	400	100	300	750	400	350	300		



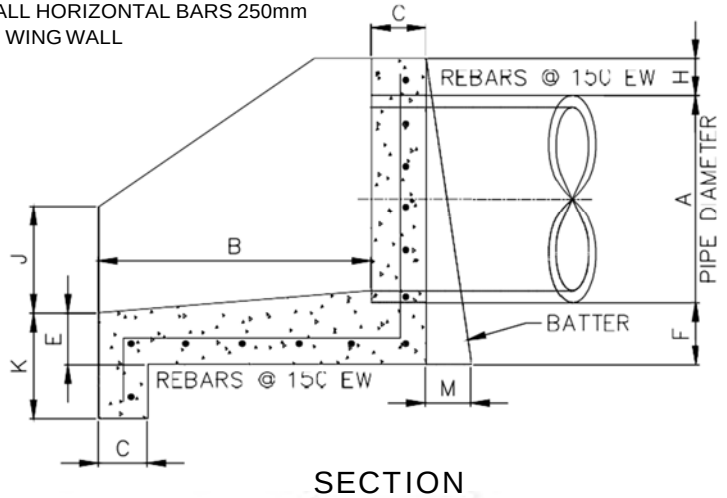
FRONT VIEW



PLAN

NOTE:

1. CONCRETE TO BE 25 MPa@ 28 DAYS. SULPHATE RESISTANT
2. LAP ALL HORIZONTAL BARS 250mm INTO WING WALL



SECTION

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD

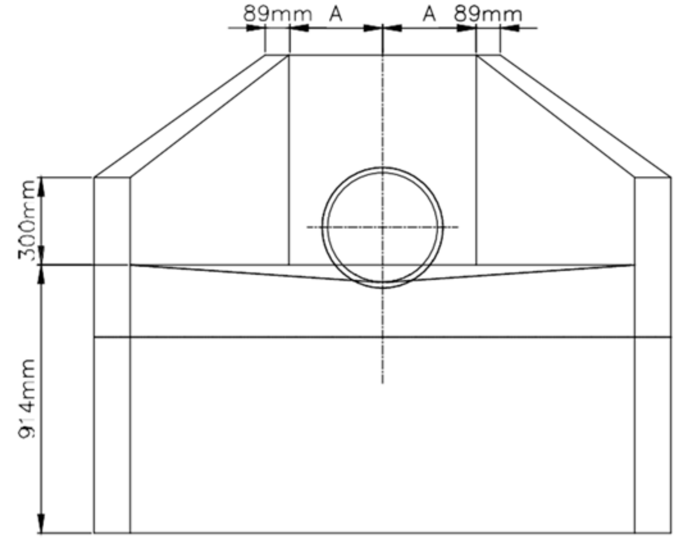
STANDARD STORM OUTLET STRUCTURE

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: C-107

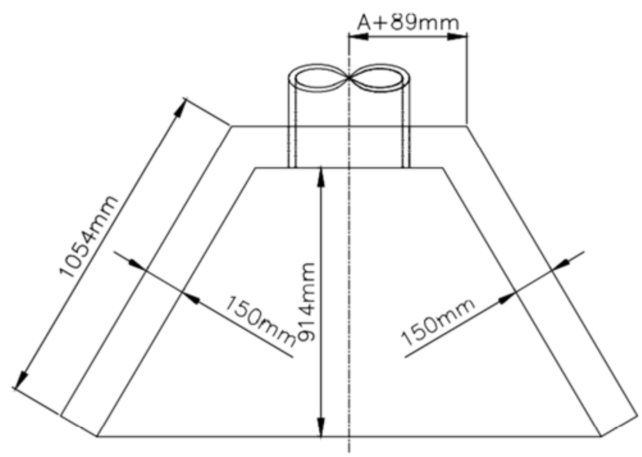
PIPE DIA.	A	B
150 to 300	250	864
375	300	914
450	375	1067
525	375	1118
600	450	1220



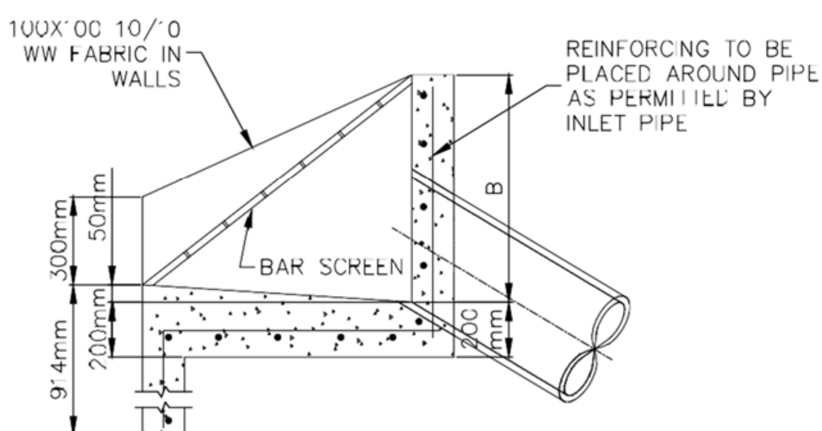
FRONT VIEW

NOTE:

1. COVER FOR REINFORCING STEEL SHALL BE 50mm MIN EXCEPT IN BASE SLAB WHERE MIN SHALL BE 75mm.
2. CONCRETE TO BE 25 MPa @ 28 DAYS. SULPHATE RESISTANT
3. LAP ALL HORIZONTAL BARS 250mm INTO WING WALL



PLAN



SECTION

WHEATLAND COUNTY
Where There's Room to Grow

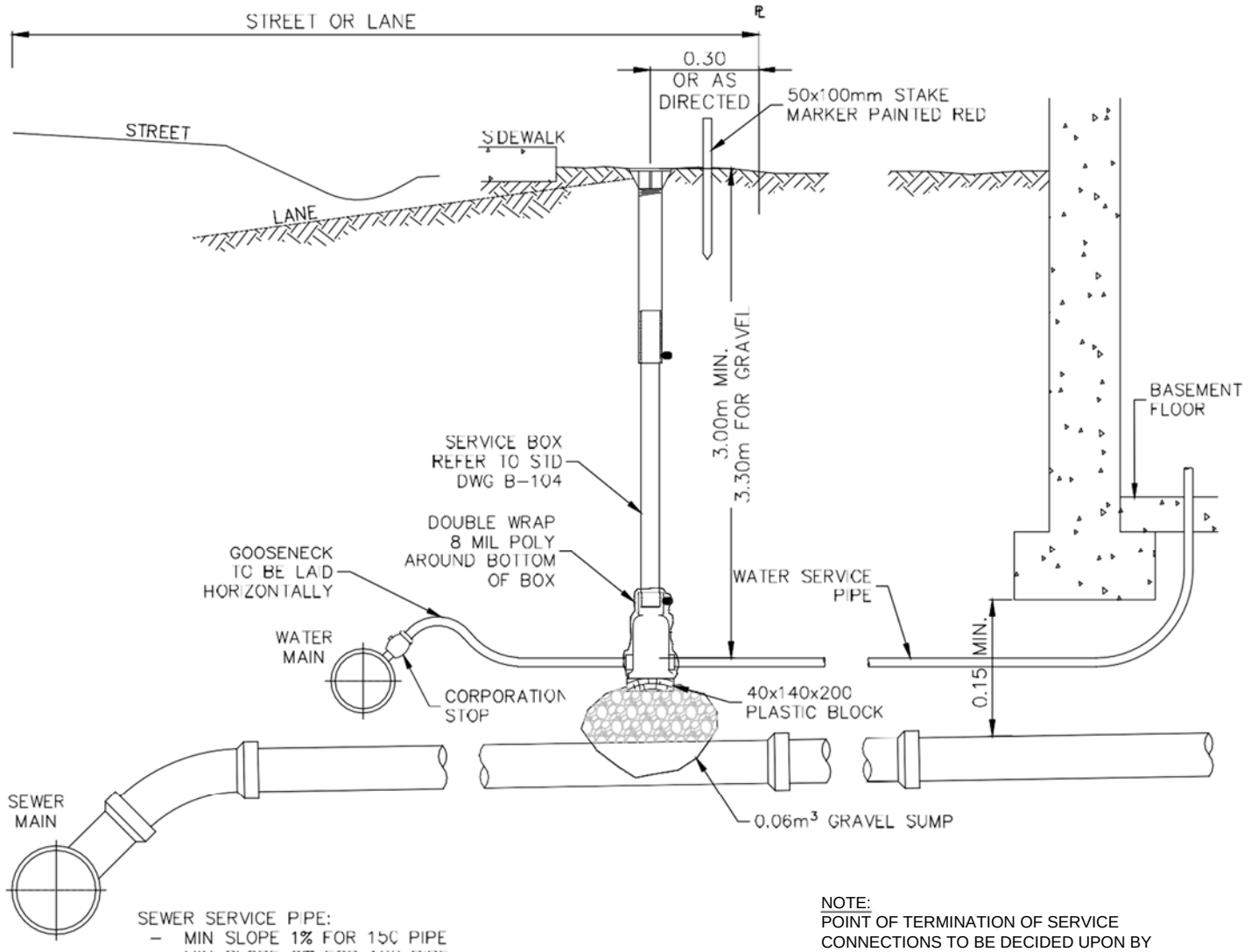
MUNICIPAL STANDARD

STANDARD STORM INLET STRUCTURE

ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: C-108



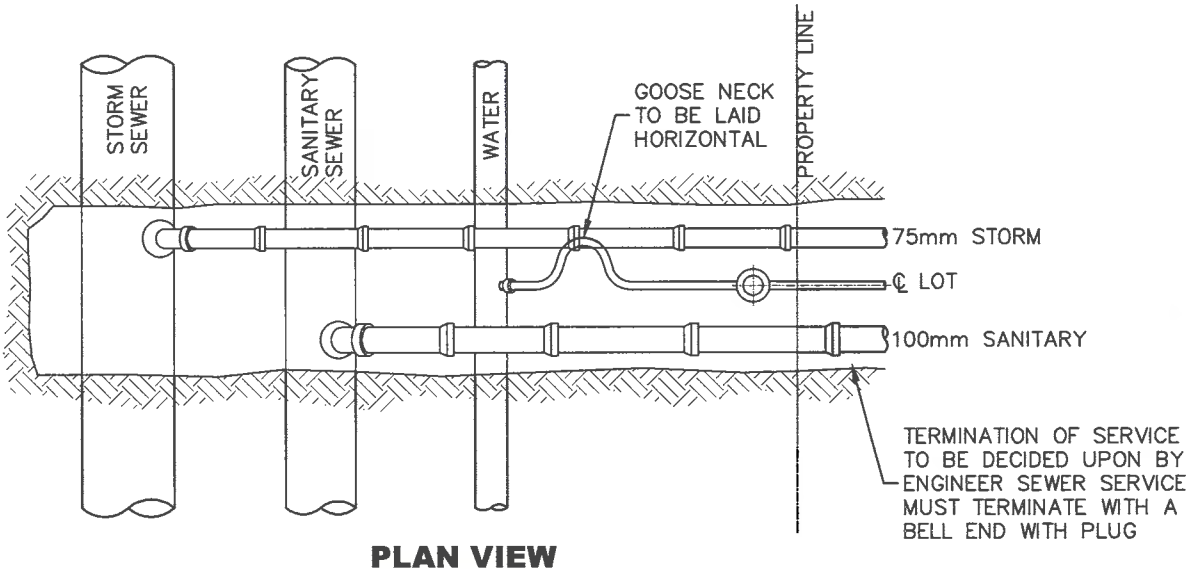
SEWER SERVICE PIPE:
- MIN SLOPE 1% FOR 150 PIPE
- MIN SLOPE 2% FOR 100 PIPE

NOTE:
POINT OF TERMINATION OF SERVICE CONNECTIONS TO BE DECIDED UPON BY ENGINEER AS DICTATED BY THE PARTICULAR PROJECT.

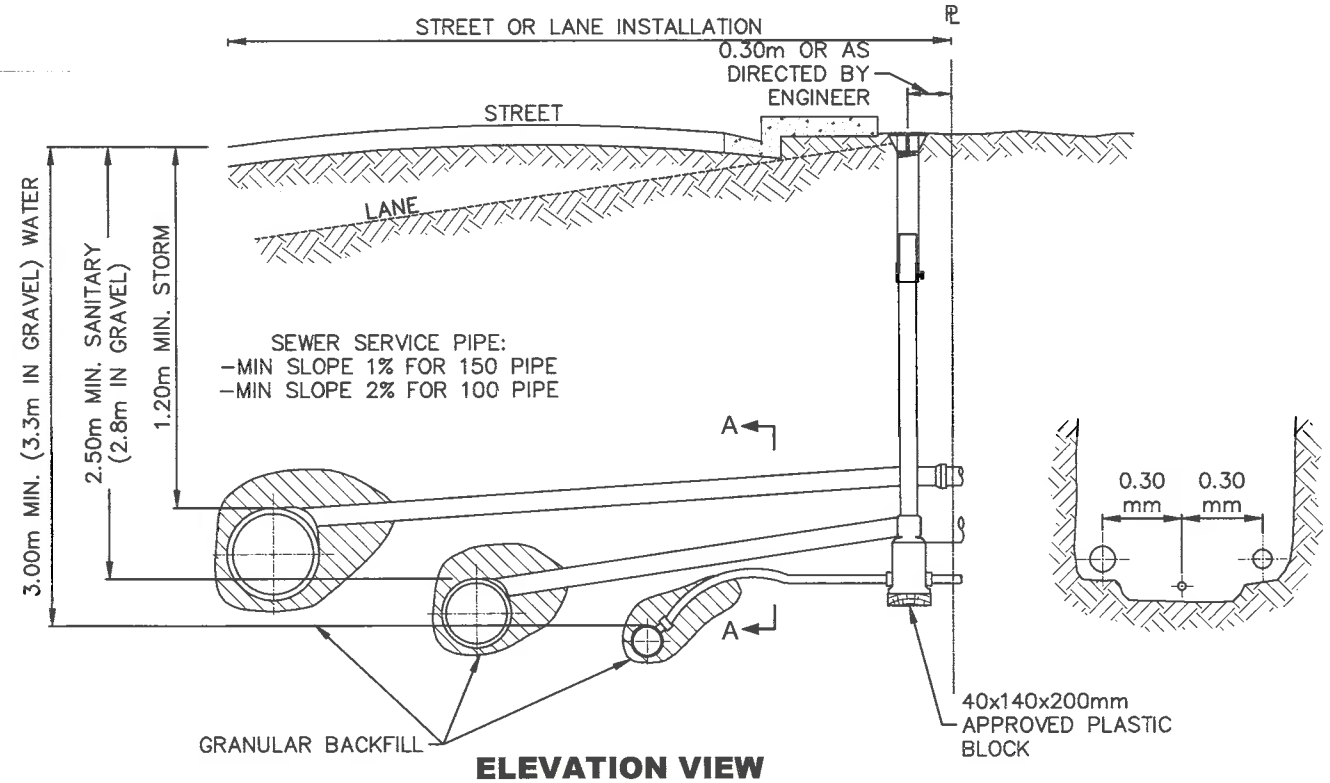
REFERENCE STD DWG D-102

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STANDARD BUILDING SERVICE CONNECTION SANITARY AND WATER	SCALE: N.T.S.
	DRAWING: D-101



PLAN VIEW



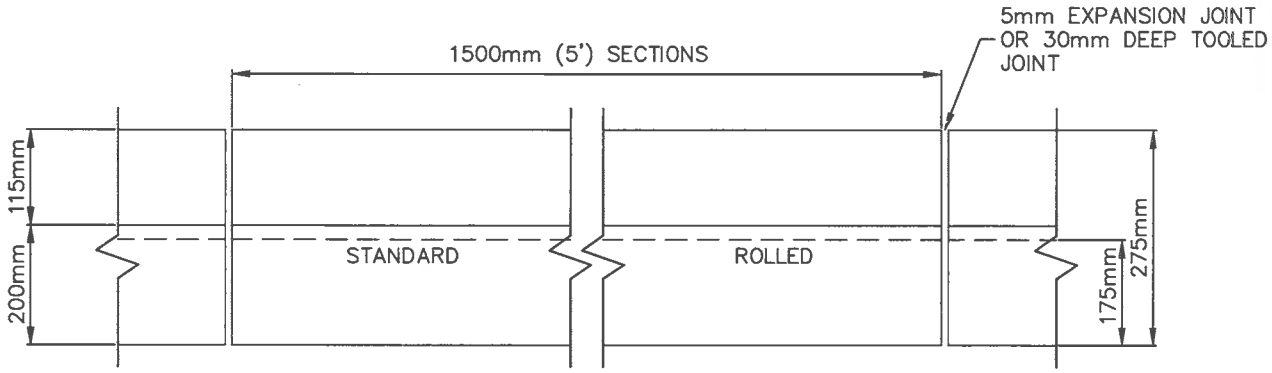
ELEVATION VIEW

NOTE:

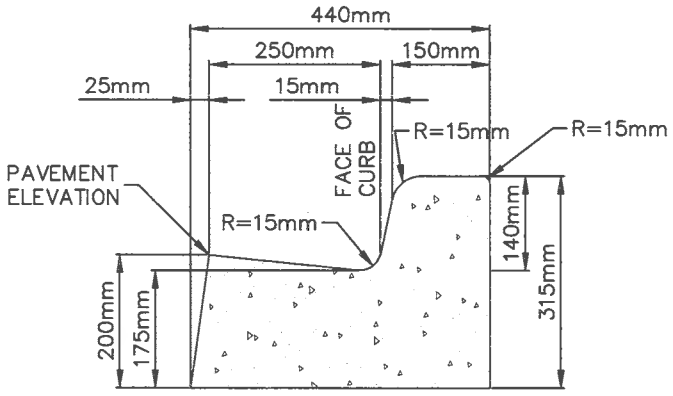
A GOOSENECK IS AN ADDITIONAL PORTION OF WATER SERVICE PIPE THAT ALLOWS FOR EASIER REPAIR AND MAINTENANCE.

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STANDARD BUILDING SERVICE CONNECTIONS AND TRENCH DETAILS	SCALE: N.T.S.
	DRAWING: D-102

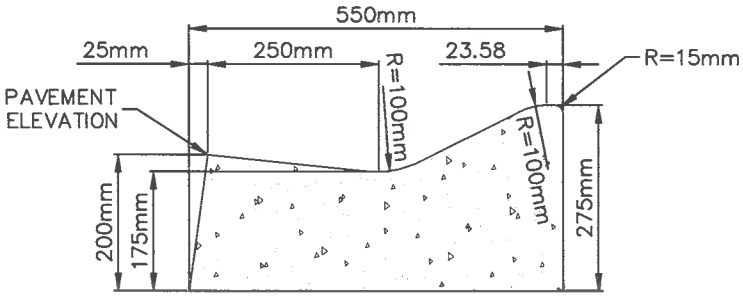


ELEVATION



SECTION
STANDARD CURB & GUTTER

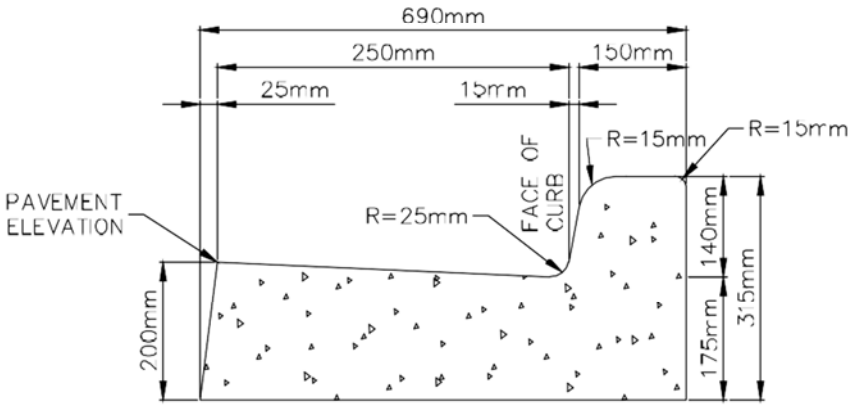
NOTE:
ON REVERSE GUTTER PAN
SLOPE=2%



SECTION
ROLLED CURB & GUTTER

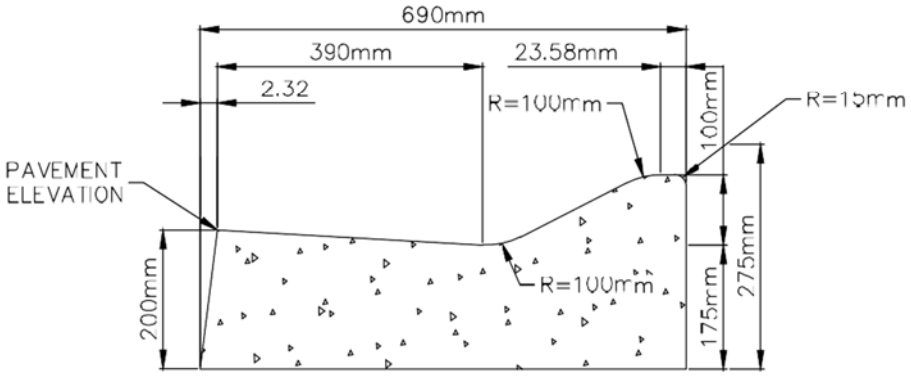
WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STANDARD & ROLLED CURB & GUTTER	SCALE: N.T.S.
	DRAWING: E-101



STANDARD CURB & GUTTER

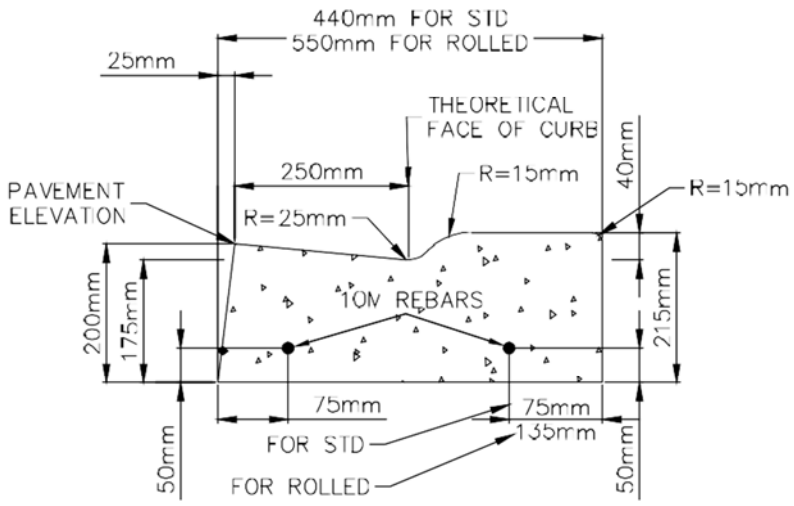
NOTE:
ON REVERSE GUTTER PAN SLOPE=2%



ROLLED CURB & GUTTER

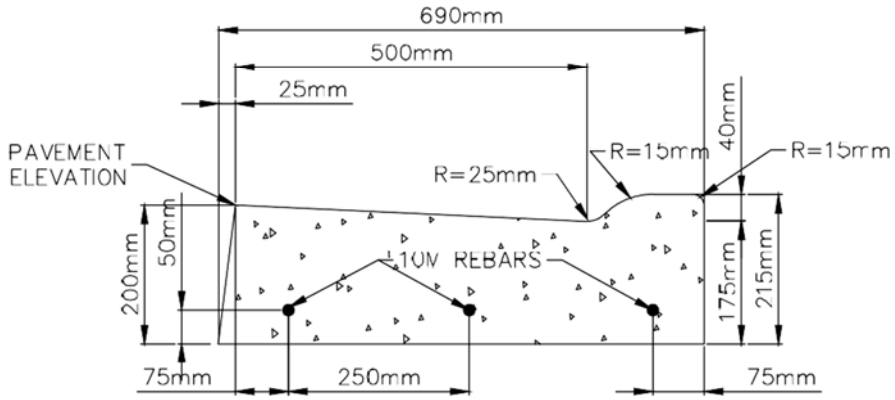
WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STANDARD & ROLLED CURB WITH 500mm (20") GUTTER	SCALE: N.T.S.
	DRAWING: E-102



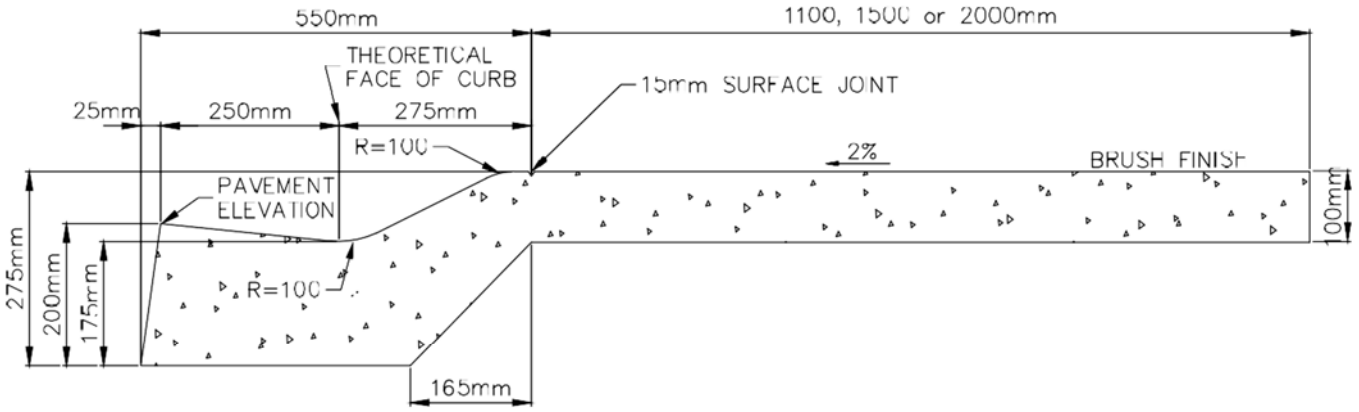
250mm (10") GUTTER CROSSING

NOTE:
ON REVERSE GUTTER PAN
SLOPE=2%

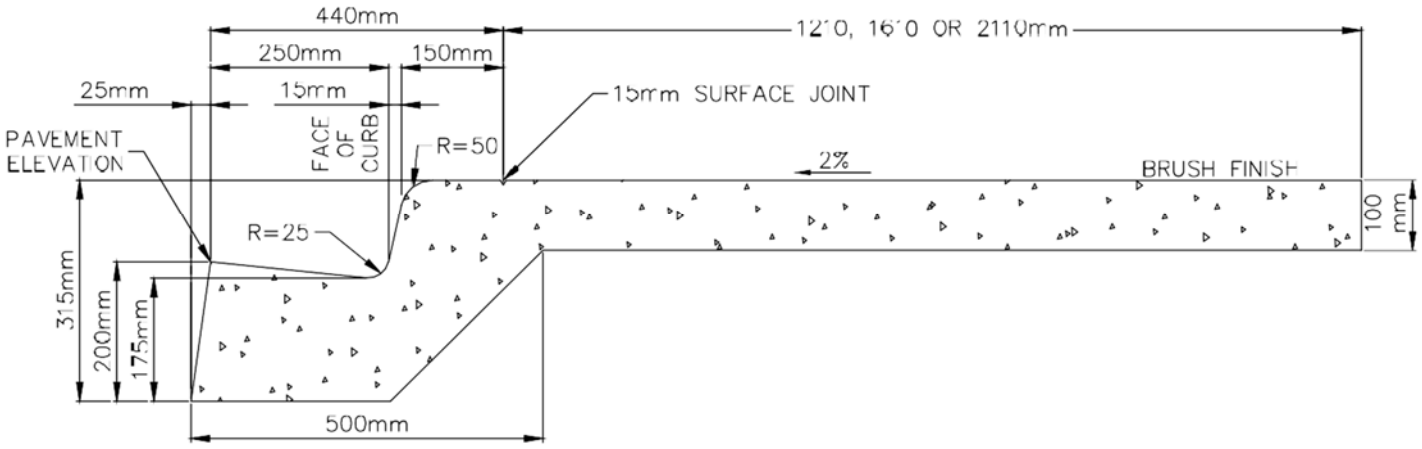


500mm (20") GUTTER CROSSING

WHEATLAND COUNTY Where There's Room to Grow	MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
	CURB & GUTTER CROSSING	SCALE: N.T.S. DRAWING: E-103



LOW PROFILE ROLLED



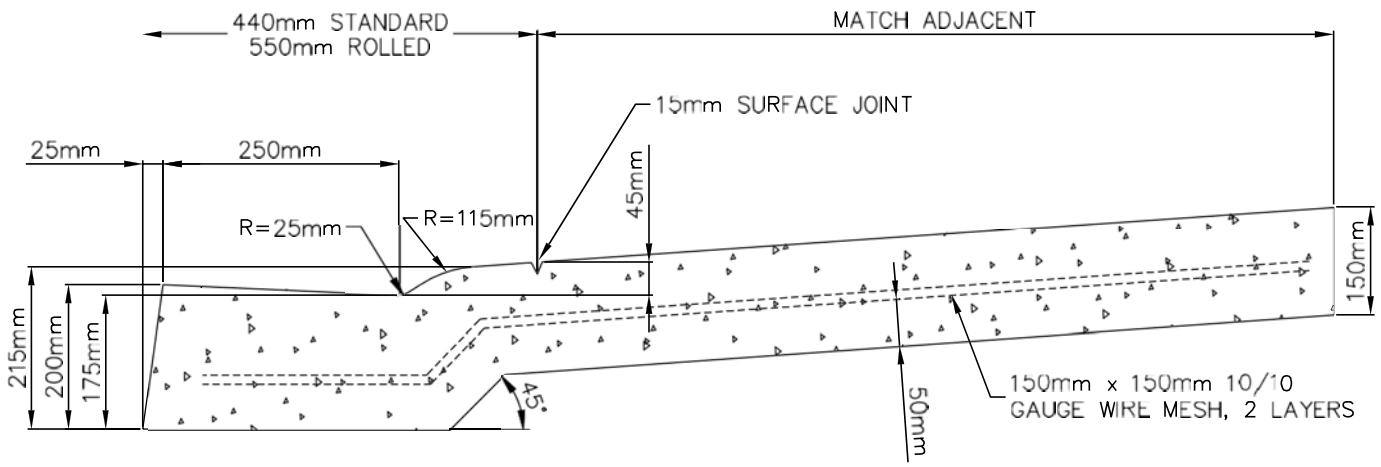
STANDARD

NOTES:

1. CROSSFALL ON WALK PORTION NOT TO EXCEED 2%.
2. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB DRAINAGE SYSTEM.

WHEATLAND COUNTY
Where There's Room to Grow

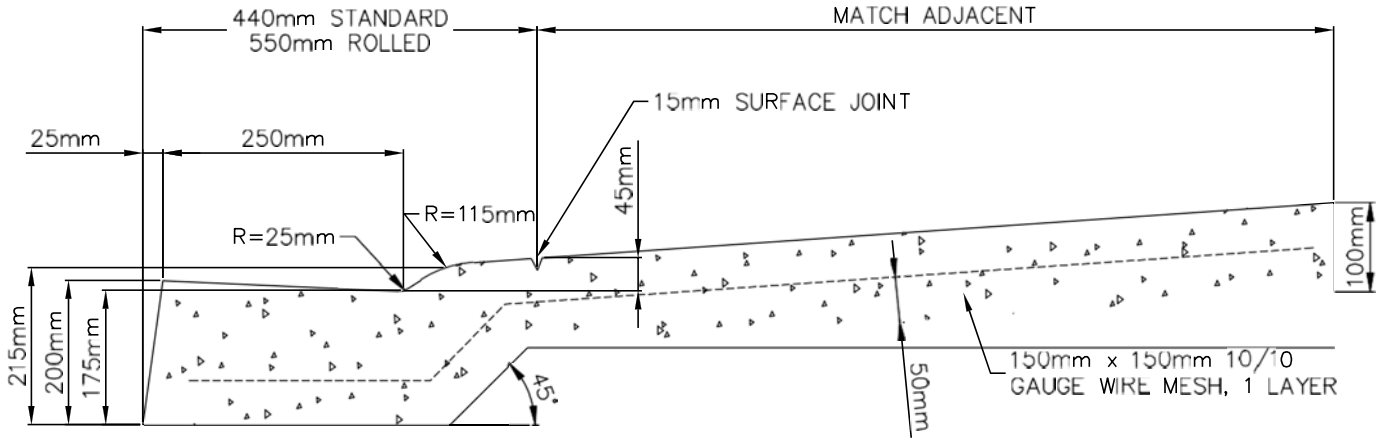
MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
MONOLITHIC SIDEWALKS	SCALE: N.T.S.
	DRAWING: E-104



NOTES:

NO EXPANSION JOINT IN CROSSING

MONOLITHIC LANE COMMERCIAL CROSSING



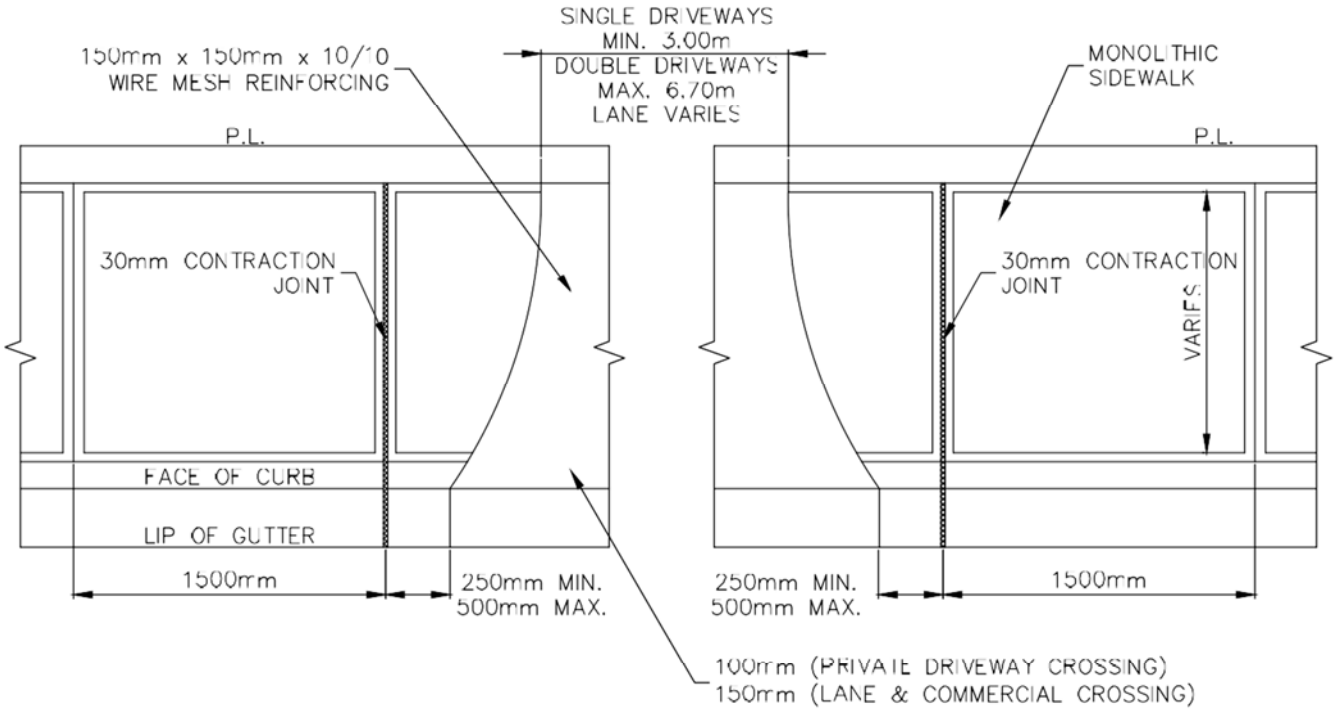
NOTES:

NO EXPANSION JOINT IN CROSSING

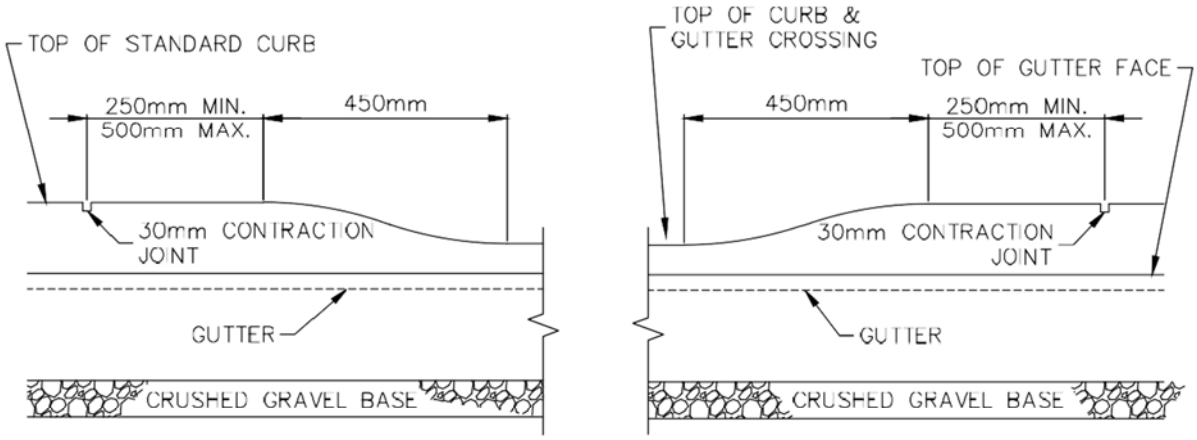
MONOLITHIC PRIVATE DRIVEWAY CROSSING

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
MONOLITHIC SIDEWALKS CROSSINGS	SCALE: N.T.S.
	DRAWING: E-105



PLAN VIEW



ELEVATION VIEW

NOTES:

1. 30mm DEEP TOOLED CONTRACTION JOINT EVERY 1500mm
2. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB DRAINAGE SYSTEM.

WHEATLAND COUNTY
Where There's Room to Grow

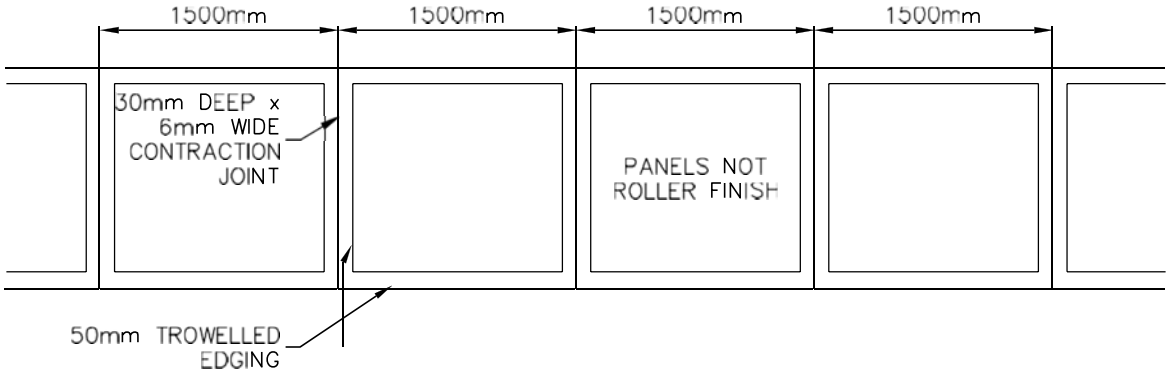
MUNICIPAL STANDARD

MONOLITHIC SIDEWALK CROSSING

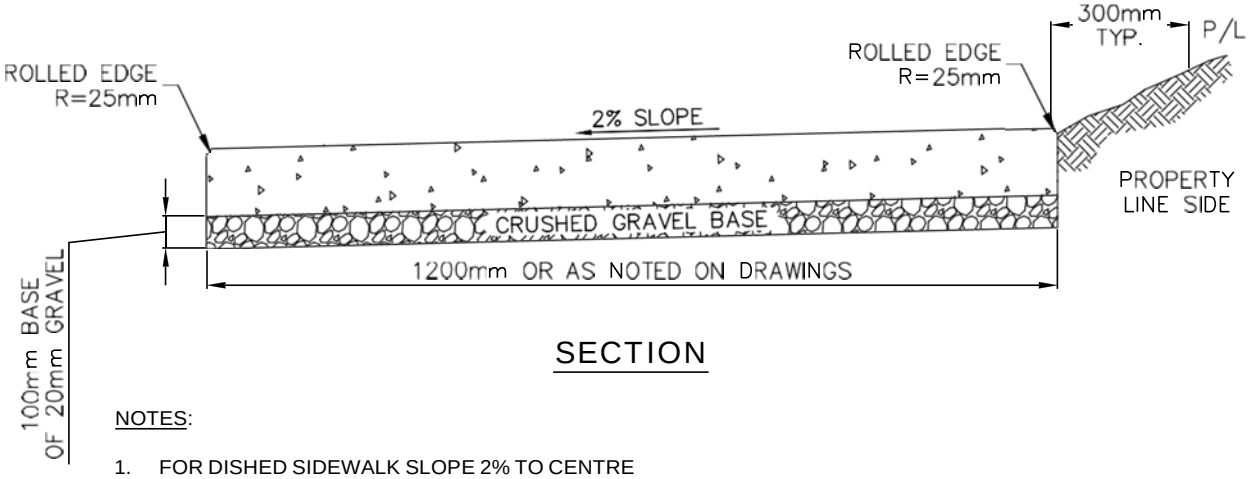
ISSUE DATE: JUN, 2016

SCALE: N.T.S.

DRAWING: E-106



PLAN



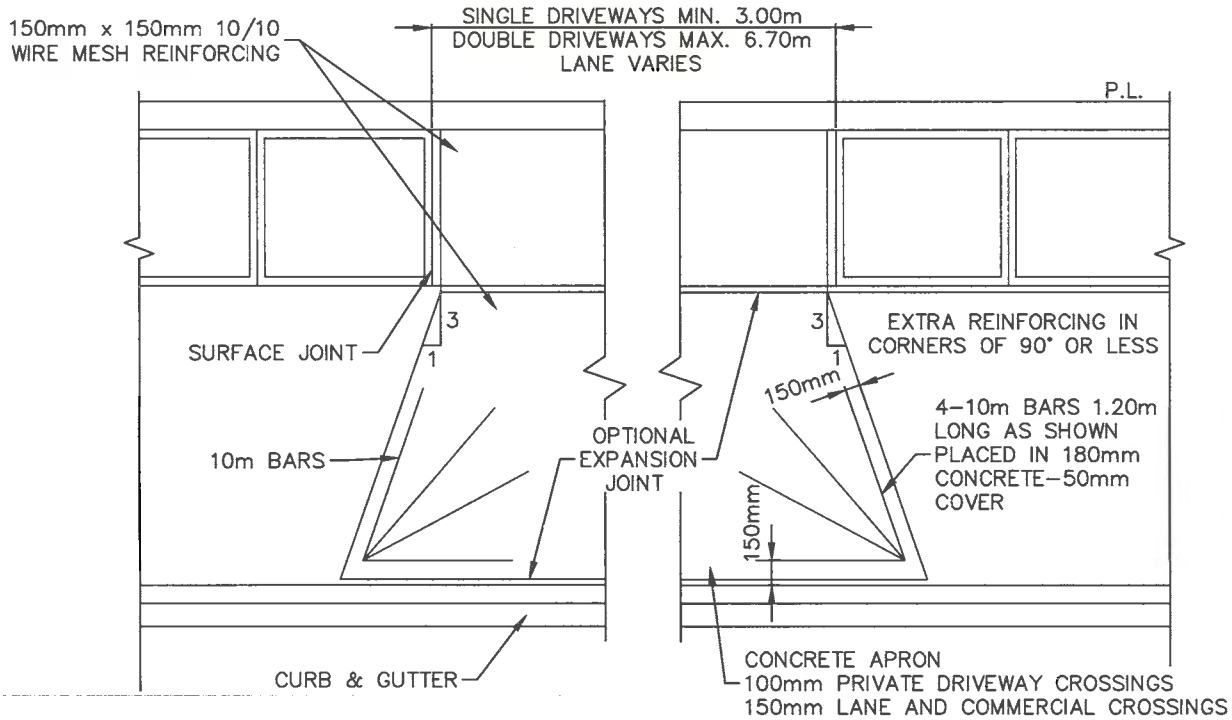
SECTION

NOTES:

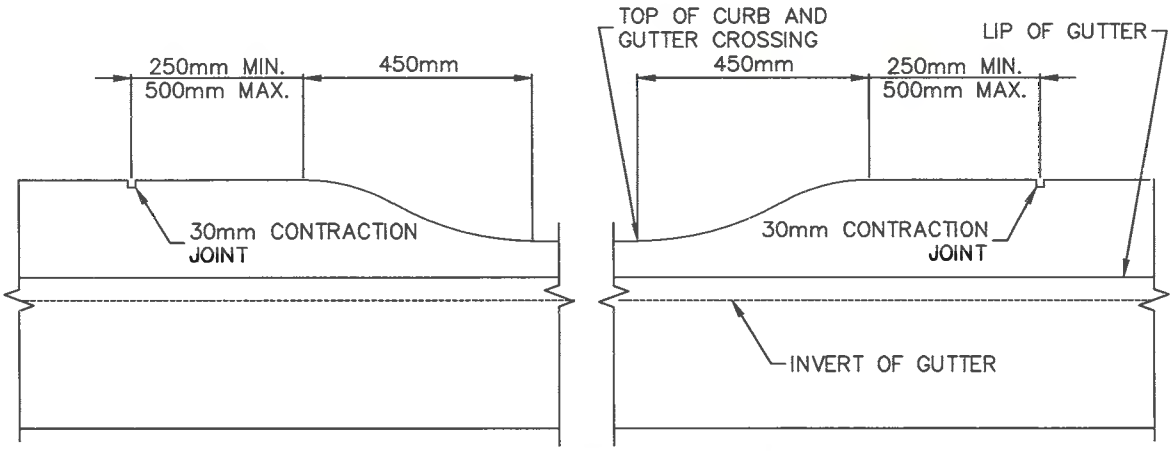
1. FOR DISHED SIDEWALK SLOPE 2% TO CENTRE
2. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB DRAINAGE SYSTEM.

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
SEPARATE SIDEWALKS DETAILS	SCALE: N.T.S.
	DRAWING: E-107



PLAN VIEW



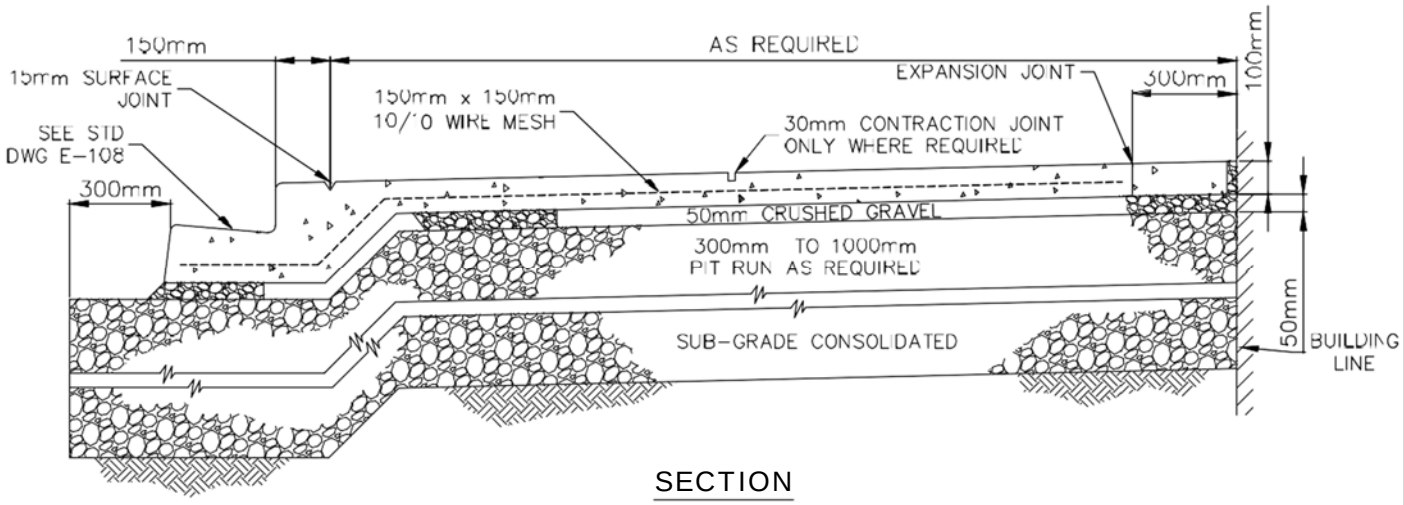
ELEVATION VIEW

NOTES:

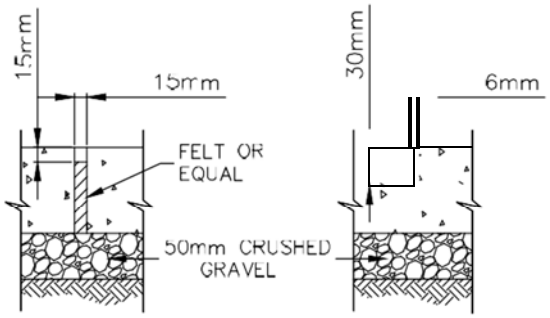
1. THIS DRAWING ONLY APPLIES IF BLVD. WIDTH IS GREATER THAN 1.00m. WHEN BLVD. WIDTH IS 1.00m OR LESS THE APRON AND SIDEWALK ARE TO BE POURED AS ONE WITH 30mm DEEPTOOLED JOINT ALONG FACE OF WALK OR AS SPECIFIED BY THE FIELD ENGINEER.
2. SPECIFICATION ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB REINFORCEMENT OR SUB DRAINAGE SYSTEM.

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
CROSSING FOR SEPARATE SIDEWALK	SCALE: N.T.S.
	DRAWING: E-108

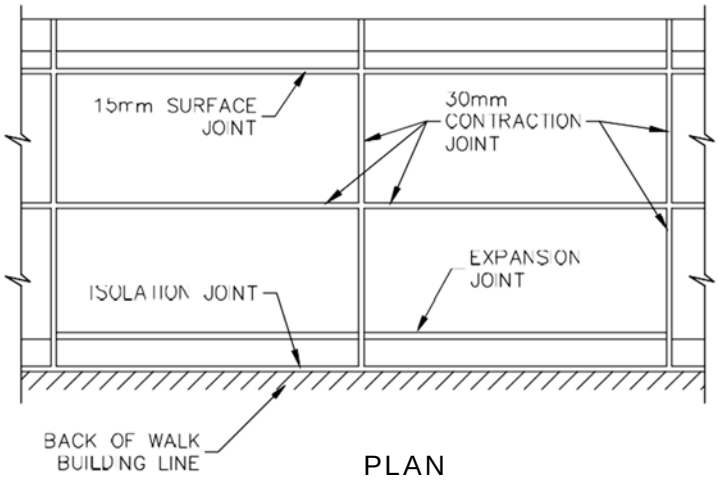


SECTION



EXPANSION JOINT DETAIL

CONTRACTION JOINT DETAIL



PLAN

NOTES:

1. IF SIDEWALK ABUTS BUILDING INSULATE BELOW GRAVEL BASE

WHEATLAND COUNTY
Where There's Room to Grow

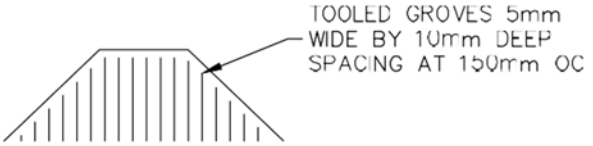
MUNICIPAL STANDARD

STANDARD MONOLITHIC COMMERCIAL SIDEWALK

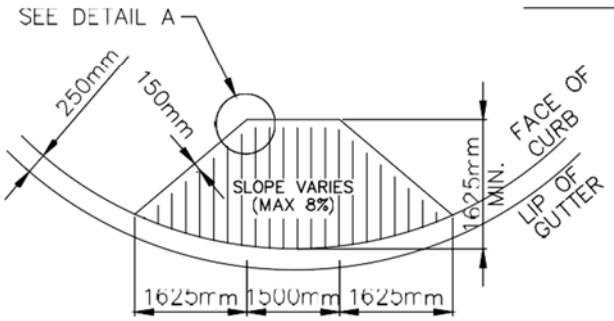
ISSUE DATE: JUN, 2016

SCALE: N.T.S.

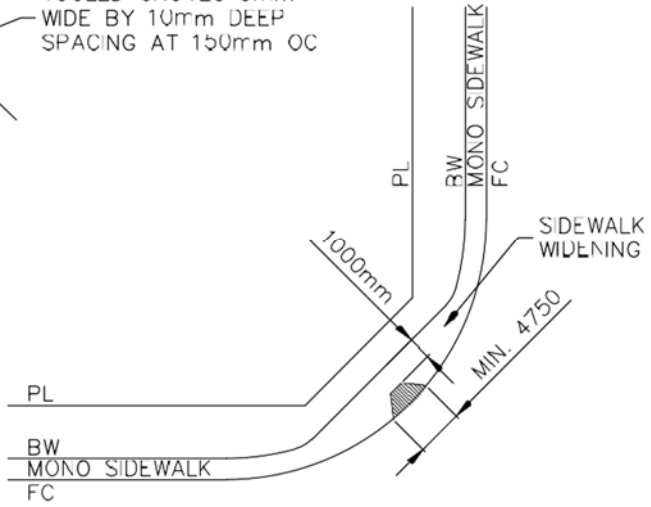
DRAWING: E-109



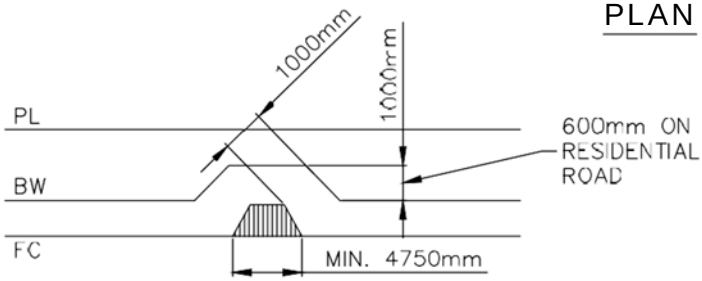
DETAIL A



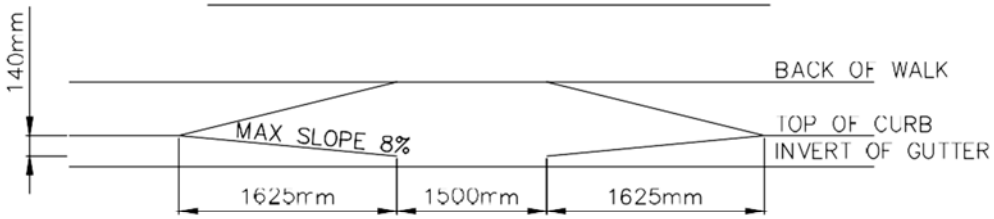
PLAN



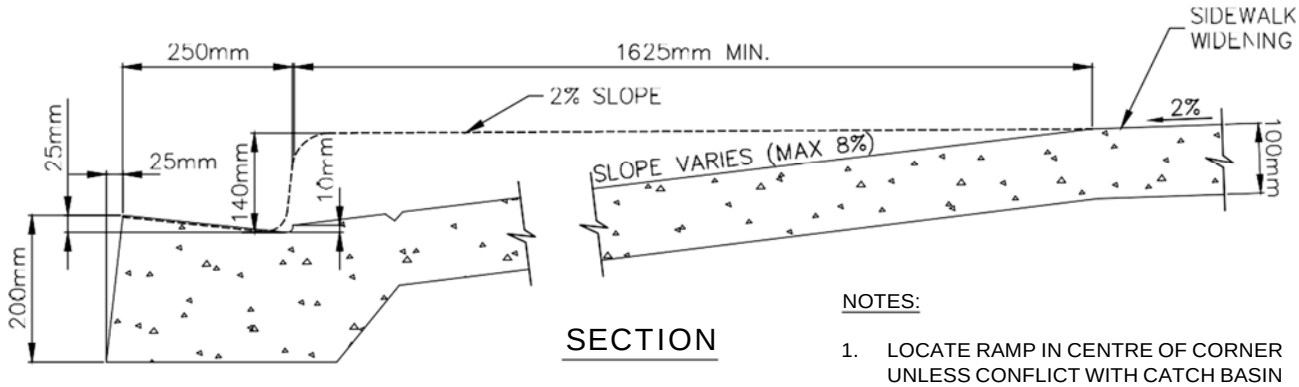
PLAN



MID-BLOCK WHEEL CHAIR RAMP



ELEVATION



SECTION

NOTES:

1. LOCATE RAMP IN CENTRE OF CORNER UNLESS CONFLICT WITH CATCH BASIN
2. MINIMUM WIDTH OF RAMP 1500
3. MAXIMUM SLOPE OF RAMP 8% (12.5:1)
4. RAMP SURFACE TO BE TEXTURED CONCRETE

WHEATLAND COUNTY
Where There's Room to Grow

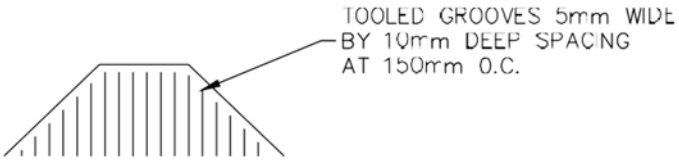
MUNICIPAL STANDARD

STANDARD WHEELCHAIR RAMP
FOR MONOLITHIC SIDEWALK
WITH SIDEWALK WIDENING

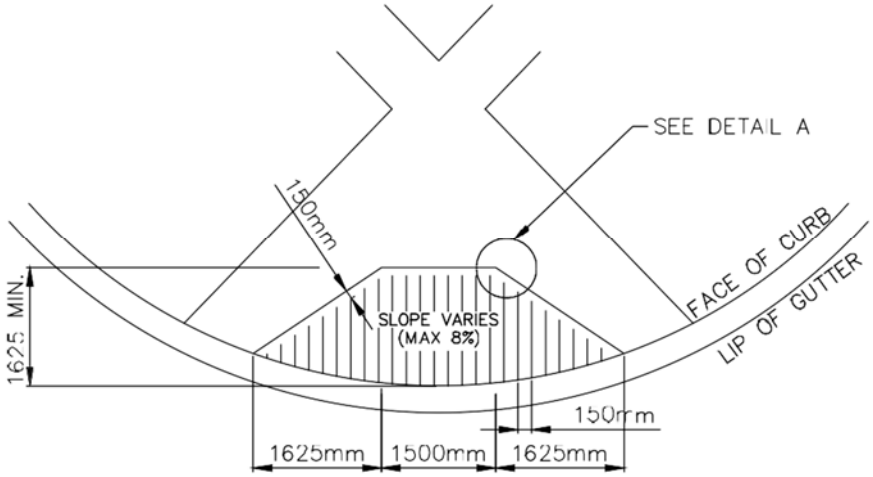
ISSUE DATE: JUN, 2016

SCALE: N.T.S.

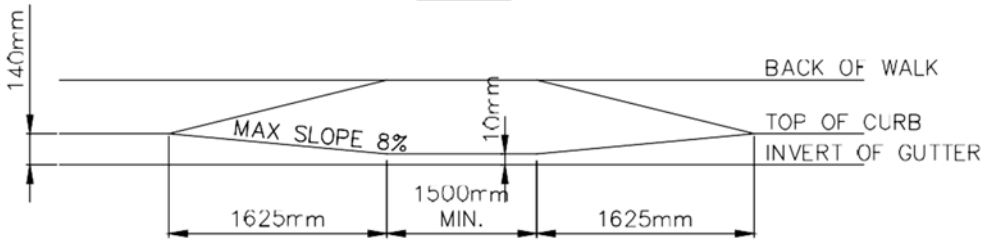
DRAWING: E-110



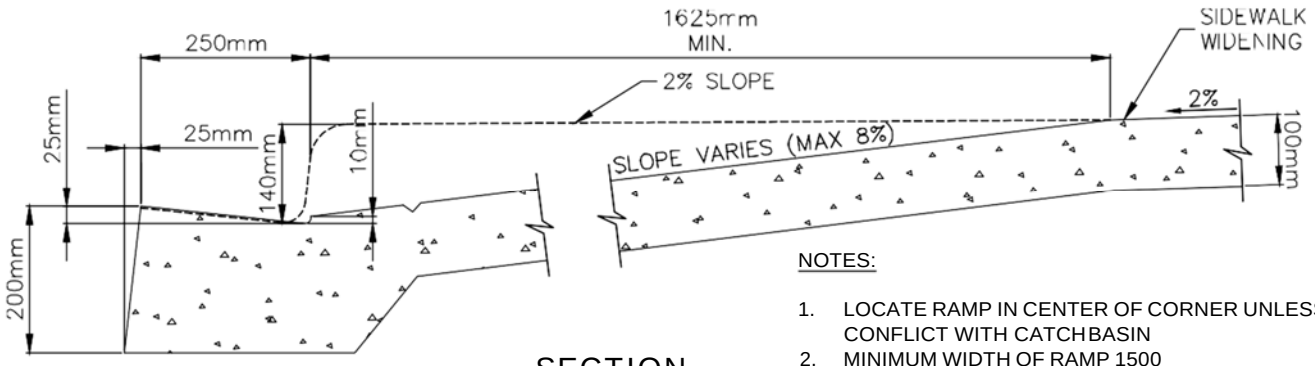
DETAIL A



PLAN



ELEVATION



SECTION

NOTES:

1. LOCATE RAMP IN CENTER OF CORNER UNLESS CONFLICT WITH CATCHBASIN
2. MINIMUM WIDTH OF RAMP 1500
3. MAXIMUM SLOPE OF RAMP 8% (12.5:1)
4. RAMP SURFACE TO BE TEXTURED CONCRETE.
5. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB DRAINAGE SYSTEM.

WHEATLAND COUNTY
Where There's Room to Grow

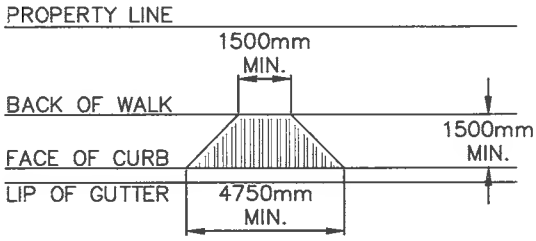
MUNICIPAL STANDARD

ISSUE DATE: JUN, 2016

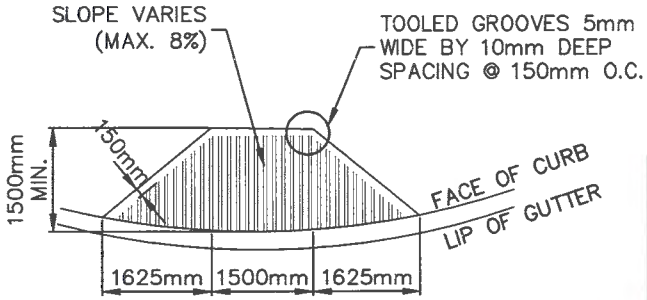
STANDARD WHEELCHAIR RAMP FOR SEPARATE SIDEWALK

SCALE: N.T.S.

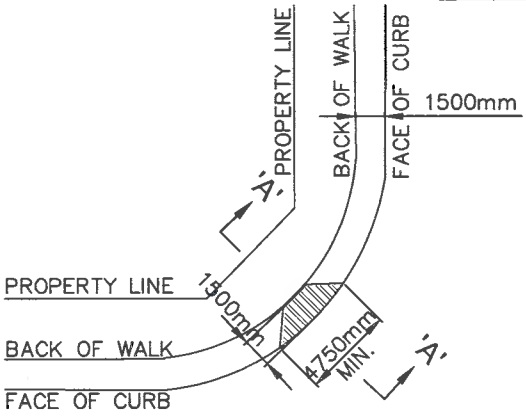
DRAWING: E-111



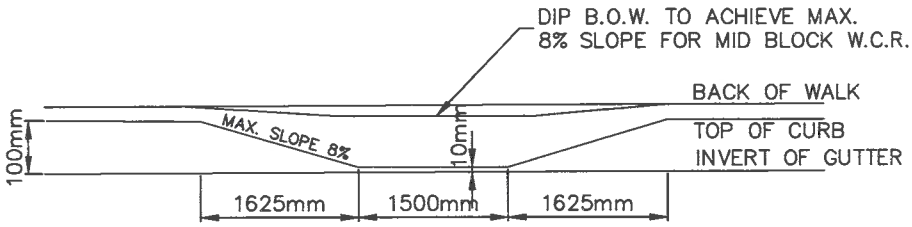
MID-BLOCK WHEEL CHAIR RAMP PLAN



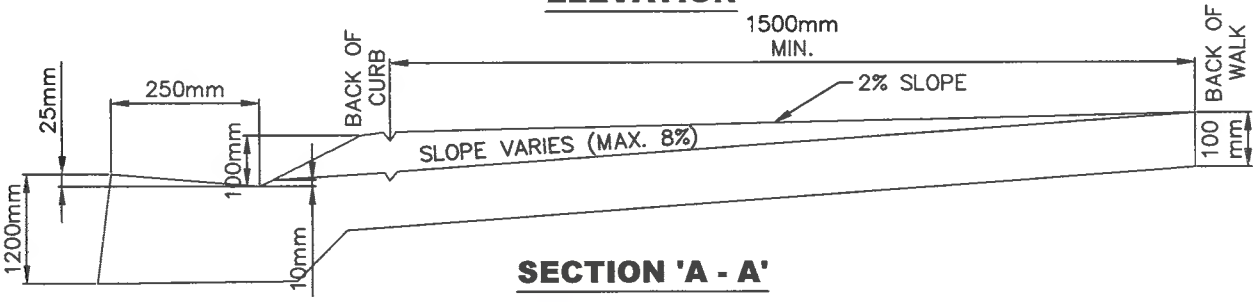
CORNER WHEEL CHAIR RAMP PLAN



PLAN MONOWALK



ELEVATION

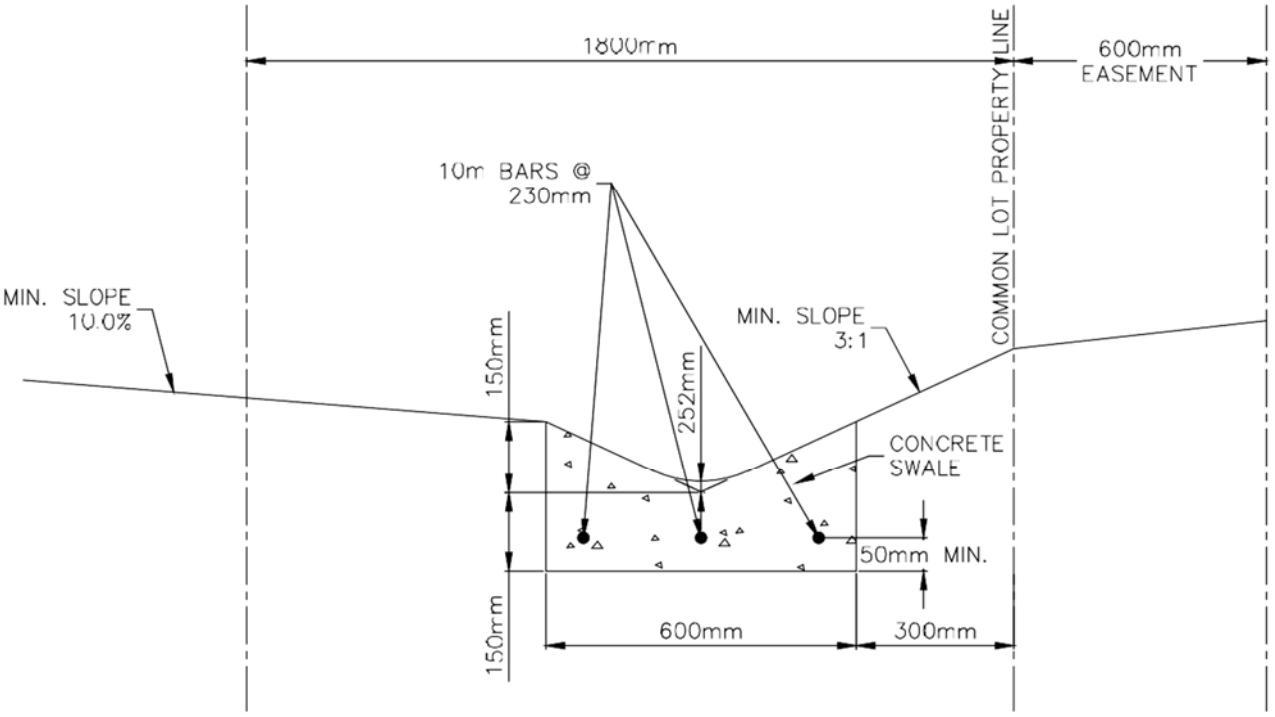


SECTION 'A - A'

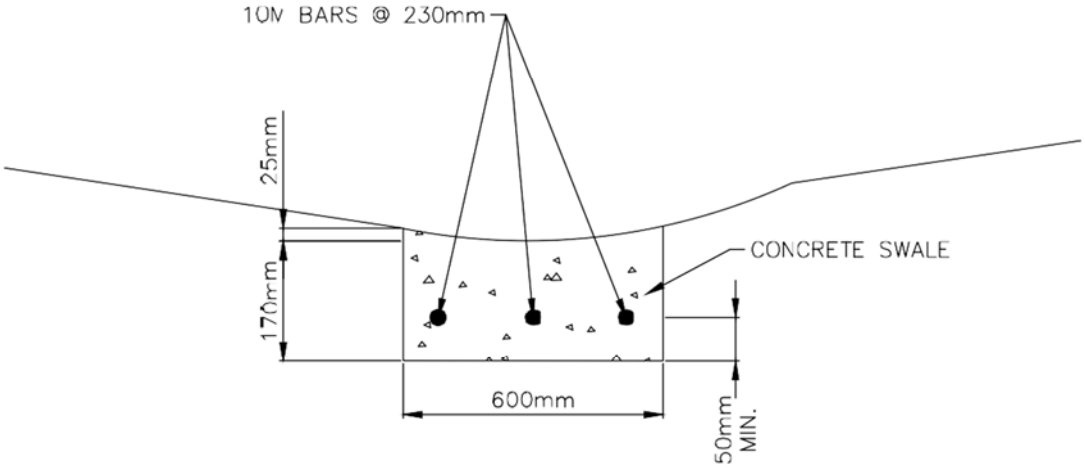
NOTE
1. LOCATE RAMP IN CENTER OF CORNER UNLESS CONFLICT WITH CATCH BASIN
2. MINIMUM WIDTH OF RAMP 1500
3. MAXIMUM SLOPE OF RAMP 8% (12.5:1)
4. RAMP SURFACE TO BE TEXTURED CONCRETE
5. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB-DRAINAGE SYSTEM

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
STANDARD WHEELCHAIR RAMP FOR MONOLITHIC SIDEWALK	SCALE: N.T.S.
	DRAWING: E-112



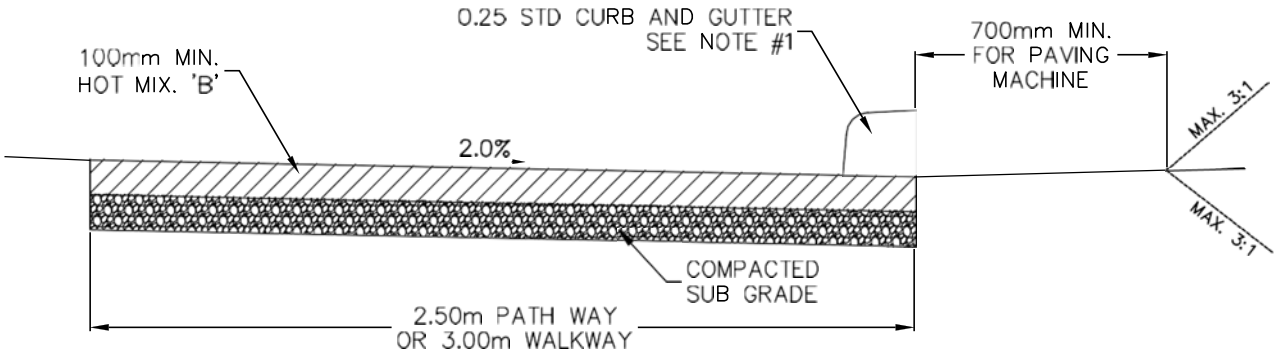
CROSS SECTION
(OUTSIDE ROAD R.O.W.)



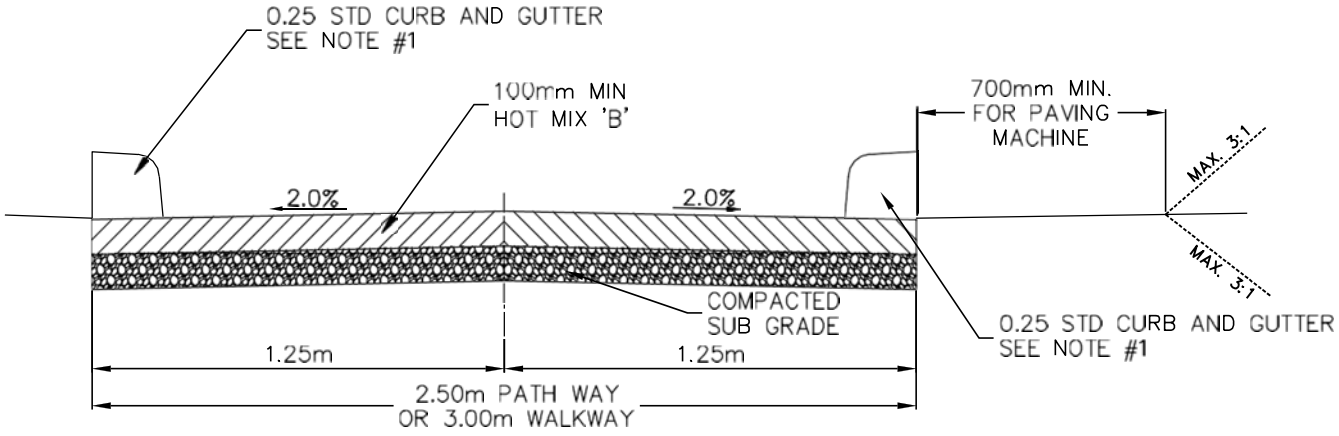
CROSS SECTION
(WITHIN ROAD R.O.W.)

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
CONCRETE SWALE	SCALE: N.T.S.
	DRAWING: E-113



SLOPED



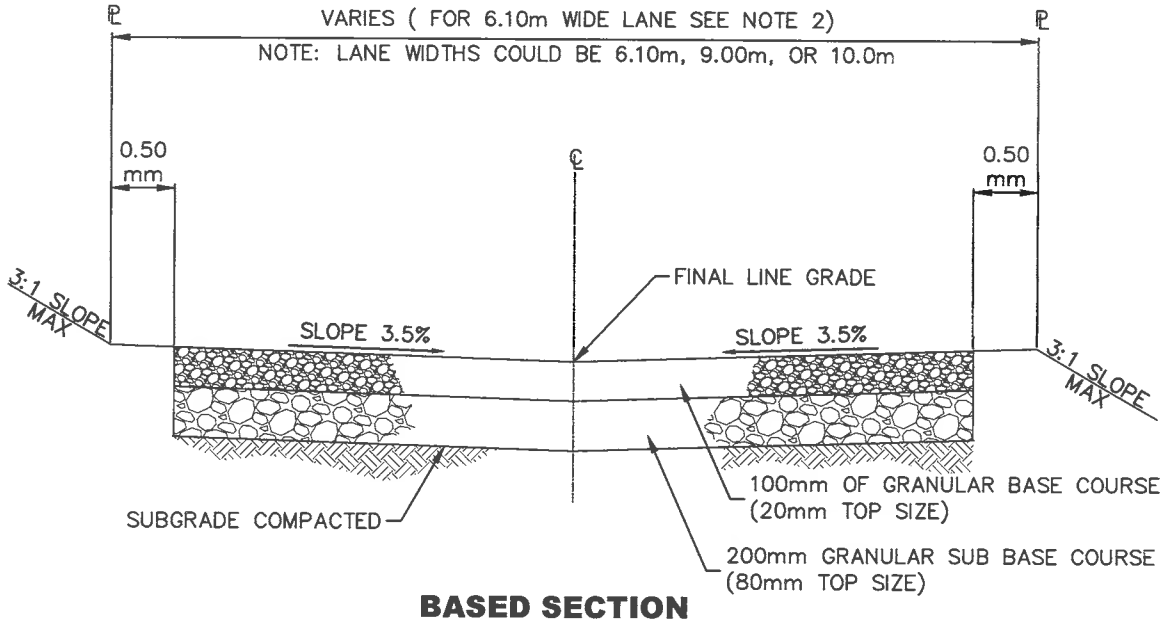
CROWNED

NOTES:

1. 0.25 STD C&G SHALL BE INSTALLED AS REQUIRED FOR DRAINAGE CONTROL.
2. COMPACTED SUBGRADE MINIMUM 95% OF MAXIMUM DRY DENSITY.
3. SPECIFICATIONS ARE TO MINIMUM STANDARDS. CONSIDERATION MUST BE GIVEN TO ADDRESS ACTUAL SOIL CONDITIONS AND ASSESS THE NEED FOR GRAVEL BASE, THICKER SLAB, REINFORCEMENT OR SUB DRAINAGE SYSTEM.

WHEATLAND COUNTY
Where There's Room to Grow

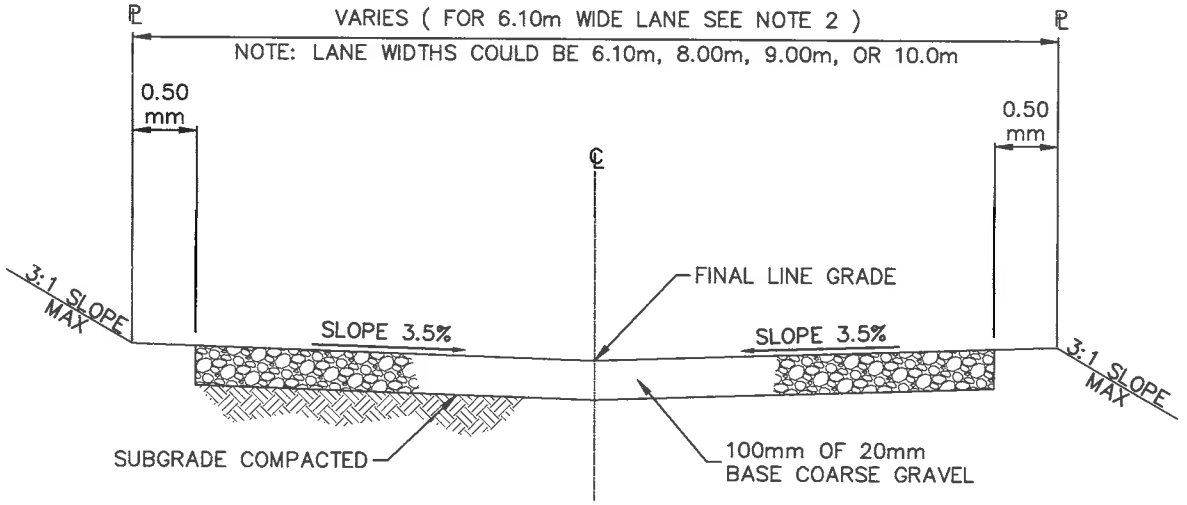
MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
ASPHALT WALKWAY & BICYCLE PATHWAY	SCALE: N.T.S.
	DRAWING: E-114



BASED SECTION

NOTES:

1. LANES SHALL BE GRAVEL BASED WHEN THE FOLLOWING CONDITIONS EXIST.
   a. WHEN THE LANE GRADE IS 5% OR GREATER, IN EXCESS OF 75m FROM THE SOURCE OF LANE DRAINAGE. THAT PORTION SHALL BE BASED.
   b. WHEN A 5% OR GREATER GRADE COMES INTO A FLATTER GRADE. THE LATTER SHALL BE BASED FOR THE FOLLOWING LENGTHS UP TO 2% -30m
      2% TO 3% -45m
      3% AND OVER -TOTAL LENGTH
2. LANES ADJACENT TO COMMERCIAL ESTABLISHMENTS SHALL BE BASED TO THE PROPERTY LINE.
3. WHEN A SWALE DISCHARGES INTO A LANE, PAVEMENT SHALL BE PLACED DOWNGRADE TO A PERMANENT DRAINAGE COLLECTION LOCATION.
4. LANES SHALL BE BASED AT INTERSECTION FOR 5.0m IN ALL DIRECTIONS.



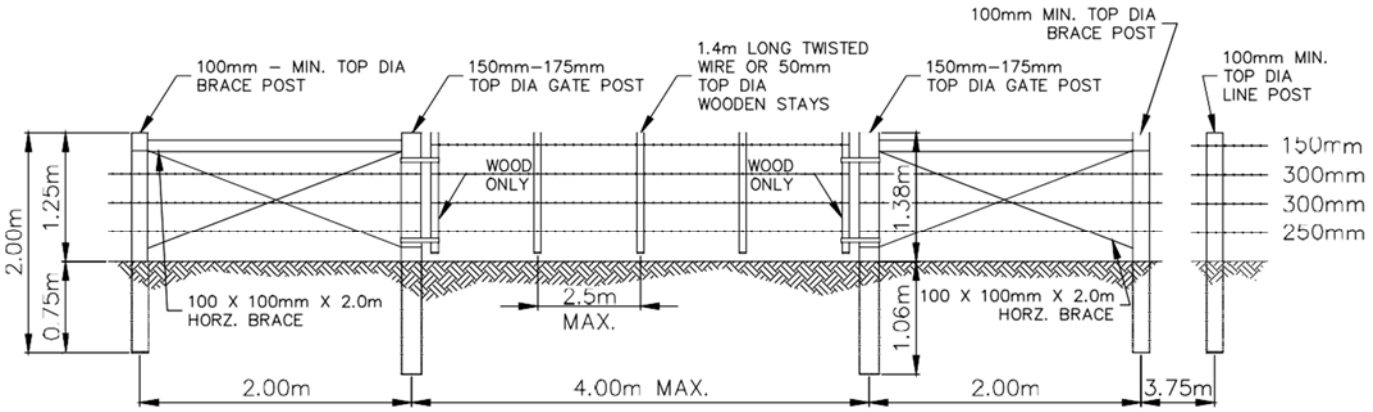
STANDARD SECTION

NOTES:

1. FOR GRAVEL SPECIFICATIONS SEE CHAPTER 303.
2. FOR 6.10m WIDE LANE, GRAVEL SHALL EXTEND FOR THE FULL WIDTH (P.L. TO P.L.)

WHEATLAND COUNTY
Where There's Room to Grow

MUNICIPAL STANDARD	ISSUE DATE: JUN, 2016
GRAVELLED LANES 6.10 TO 10.0 METERS RIGHT OF WAY	SCALE: N.T.S.
	DRAWING: H-101



ELEVATION FARM GATE

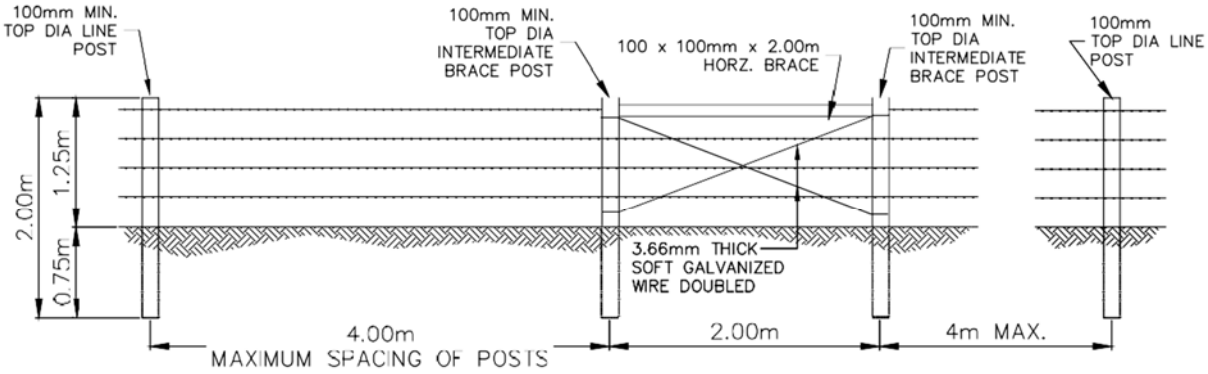
SPACING OF BRACE ASSEMBLIES
ON TANGENT – 300mm MAX.
ON CURVES – 150m MAX.

ESTIMATED MATERIAL
INCLUDED IN 1KM OF FENCING

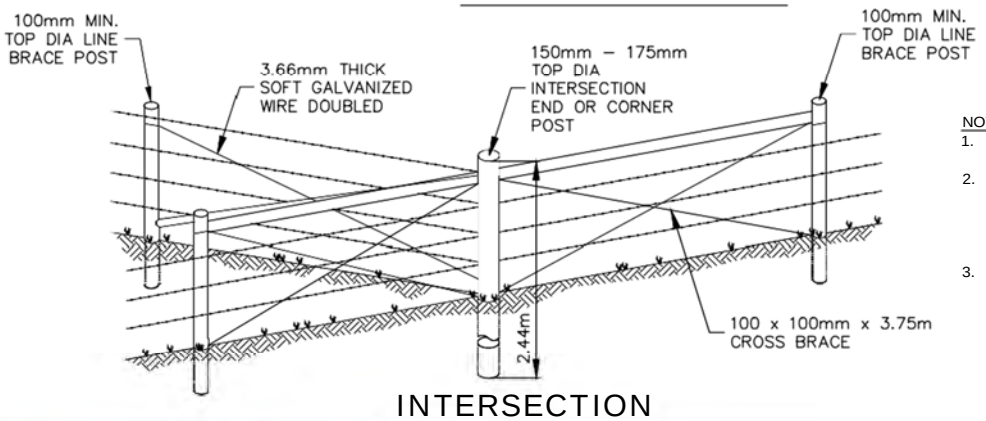
LINE POSTS – 2.13m LONG & 100mm–125mm TOP DIA.....267
BARBED WIRE (1 SPOOL=402m).....10 SPOOLS
TWO STRAND BARBED WIRE (FOUR POINT GALVANIZED
2.5mm THICK STRANDS)
400mm STAPLES (APPROX. 140 STAPLES PER kg).....8kg

ESTIMATED MATERIAL
REQUIRED FOR 1 GATE

GATE STAYS: 1.2m LONG & 55mm TOP IDA. WODDEN OR.....3
1.2m LONG TWISTED WIRE.....3
GATE INTERSECTION AND END CORNER POSTS
2.44m LONG AND 150mm–175mm TOP DIA.....4
100mmX100mm DIMENSION LUMBER BRACES.....7
3.66mm THICK SOFT GALVANIZED WIRE FOR DIAGONAL
BRACING (APPROX. 1.5kg PER BRACE).....11kg



ELEVATION FENCE



INTERSECTION

NOTES:
1. ALL FENCE POSTS SHALL BE PRESSURE TREATED.
2. ALLOWABLE TAPER FROM END TO END OF POSTS SHALL NOT EXCEED 38mm IN DIAMETER. POSTS SHALL BE INSTALLED WITH THE LARGE END DOWN.
3. SINGLE STRAND BARBED WIRE ALLOWED IF REQUESTED BY THE LANDOWNER.

WHEATLAND COUNTY
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BARBED WIRE FENCE DETAILS

ISSUE DATE: JUN, 2016

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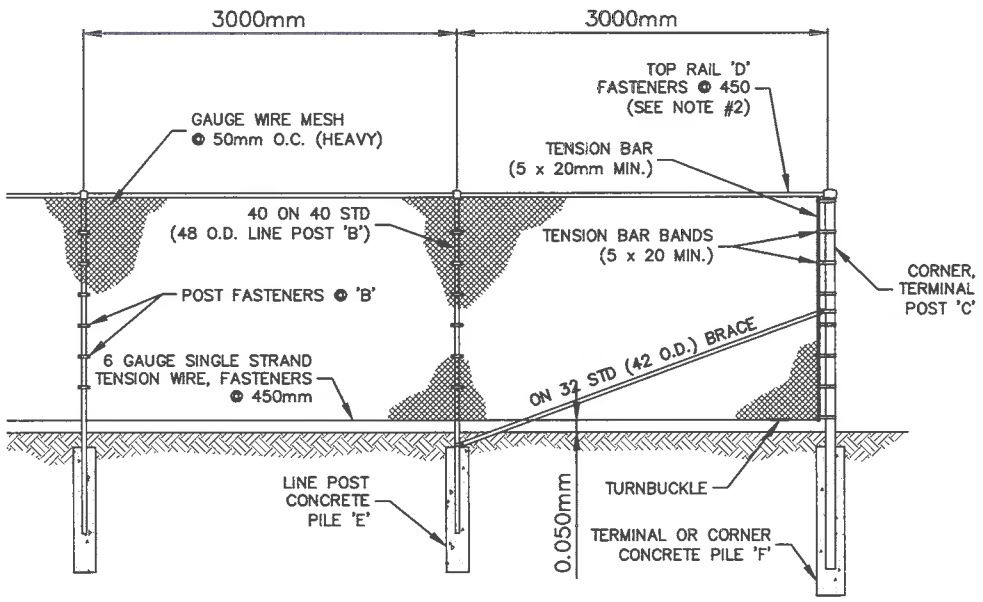
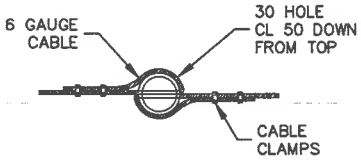
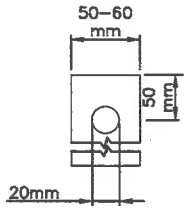
DRAWING: L-101





PILES (15 MPa SULPH. RESIST. CONC.)			
LINE POST 'E'		TERMINAL OR CORNER POST 'F'	
DIAMETER	DEPTH	DIAMETER	DEPTH
250	1000	300	1200



TOP VIEW OF CORNER & STRAINING POSTS
PLAN VIEW

DETAIL OF INTERMEDIATE POST
SIDE VIEW

POST SIZE					TOP RAILS 'D'	
NOMINAL HEIGHT 'A'	LINE POST 'B'		END, CORNER STRAIN POST 'C'		OUTSIDE DIAMETER	WEIGHT (kg/m)
	HEAVY	MEDIUM	HEAVY	MEDIUM		
1000mm		1750mm		2100mm	30mm	2.50
1250mm		2100mm		2400mm	30mm	2.50
1400mm	2400mm		2700mm		45mm	3.40
1800mm	2700mm		3000mm		45mm	3.40
OUTSIDE DIAMETER	60mm	50mm	90mm	75mm		
WEIGHT (kg/m)	5.40	4.10	11.30	8.60		

NOTES:

1. STRAIN POST SHALL BE INSTALLED AT A SPACING OF 150m OR LESS WITH BRACES SIMILAR TO THOSE USED AT END AND CORNER POSTS. (SEE TABLE 'C'). THE PILES SHALL BE THE SAME AS FOR CORNER OR END POSTS. FENCING SHALL BE GALVANIZED STEEL.

2. FOR FENCE APPLICATIONS IN MEDIAN ON DIVIDED ROADWAYS. TOP RAIL TO BE REPLACED WITH 6 GAUGE SINGLE STRAND TENSION WIRE. FASTENERS AT 450. CABLE TO BE FASTENED TO STRAINED POST BY LOOPING CABLE AND USING APPROPRIATE SIZE CABLE CLAMP (SEE DETAIL).

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MUNICIPAL STANDARD

STANDARD CHAIN LINK FENCE

ISSUE DATE: JUN, 2016

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